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THE FOUNDRY

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CLEVELAND, OHIO.

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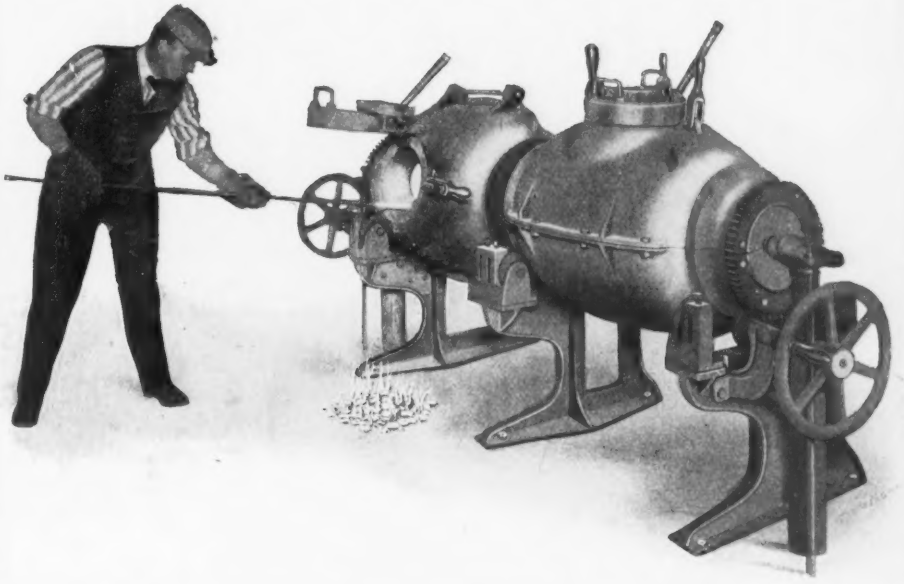

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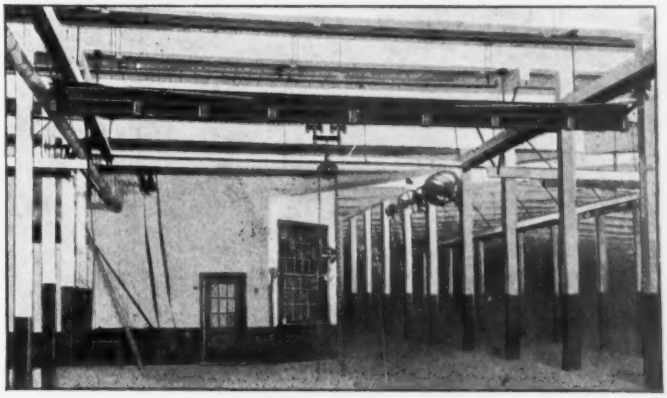

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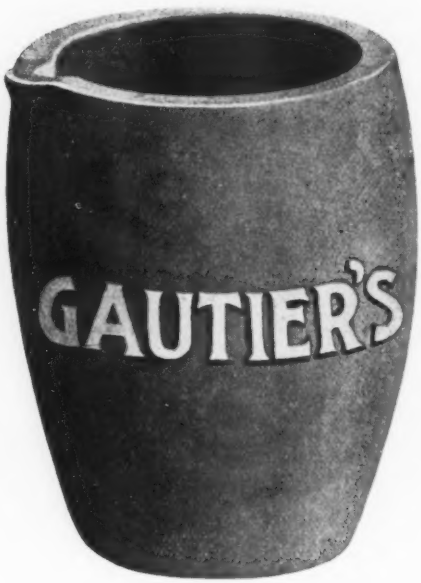

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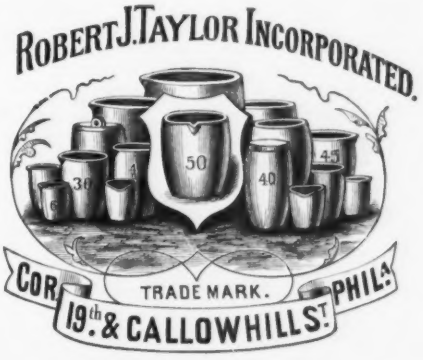

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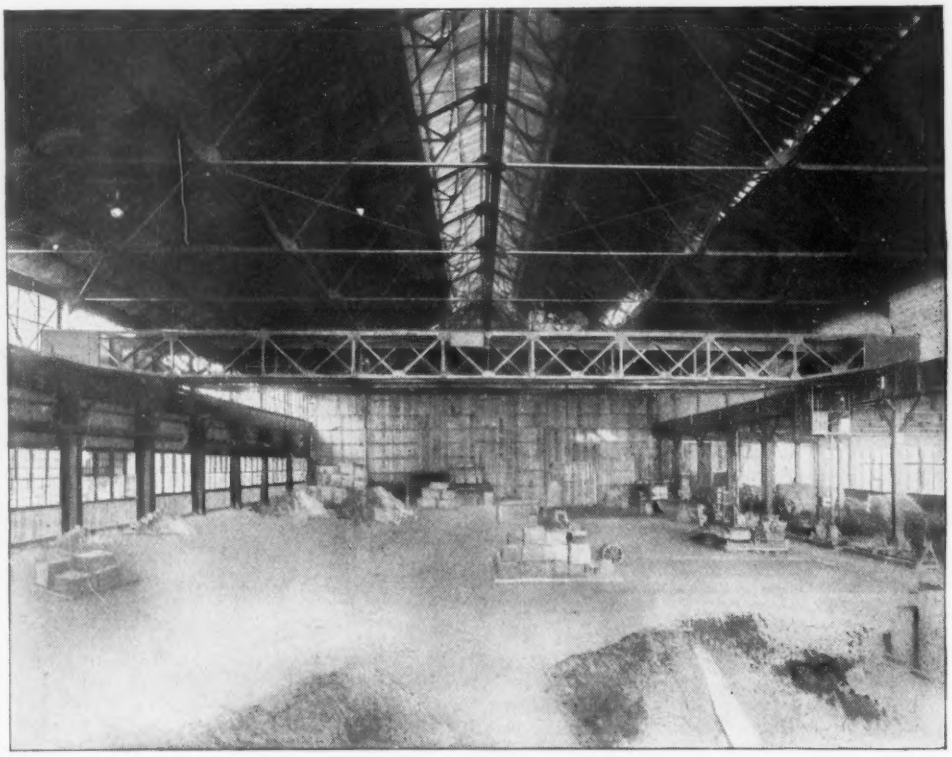

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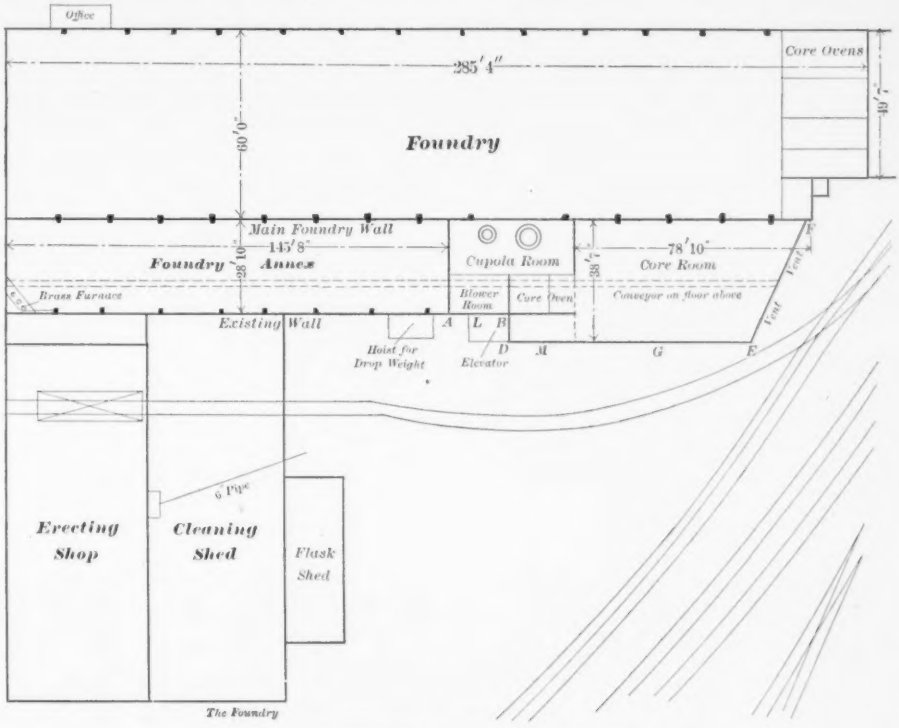
THE FOUNDRY

Vol. 25, No. 6. *CLEVELAND, OHIO, FEBRUARY, 1905.* *Whole No. 150*

Foundry of the Allis-Chalmers Co., Scranton, Pa.

When the Allis-Chalmers Co. purchased the plant of the old Dickson Mfg. Co., at Scranton, Pa., they set about remodeling it and increasing its capacity. The ground plan of the foundry then and now is not radically different, but there have been changes made which resulted in a very material increase in the capacity and in the facility with which work can be done. In fact, the changes made in these works stand as a monument of what can be done to improve the conditions in an existing plant and certainly reflect great credit on those who designed and directed the work of improvement. The foundry consists of a building 375 feet long with traveling cranes running over the entire length and having a span of 65 feet. There are one 15-ton and two 25-ton cranes in this main bay of the foundry. The cupolas are located a little west of the center of the building and divide the side bay into two parts. This side bay has a span of 28 feet and the west end of it is used as a core room, while in the east end are located the light gray iron molding floor and the brass foundry. Originally there was nothing above these departments, but a heavy concrete floor, capable of sustaining a load of 500 pounds per square foot, has been placed over these departments and this space utilized as a sand storage. It is capable of holding a sufficient amount to last the foundry all winter. The sand comes into the works in cars at the end of the foundry building. It is shoveled into a bin leading to the boot of an elevator, which raises the sand to the conveyor above the sand storage, and this con-



FOUNDRY OF ALLIS-CHALMERS CO. AT SCRANTON, PA.

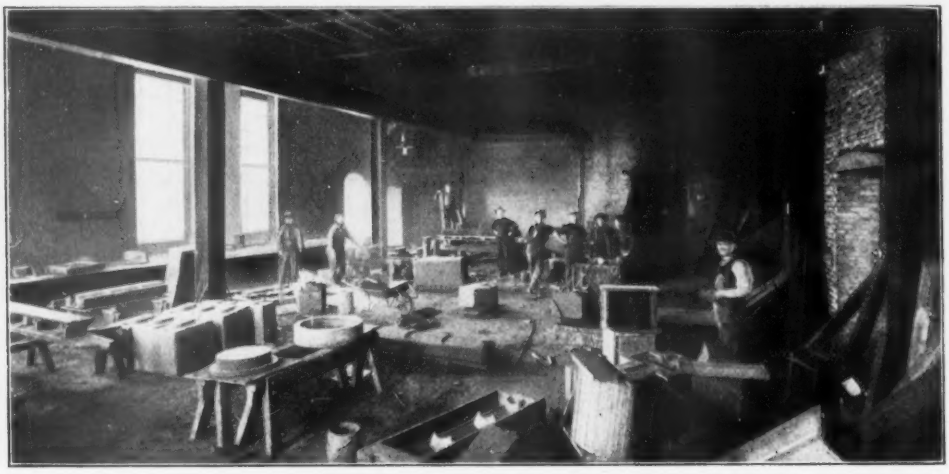
MAIN OR HEAVY WORK FLOOR.

veyor is arranged to deposit it at any desired point on the storage floor. Along the wall of the storage room are arranged a series of chutes, by means of which sand can be delivered to the molding floors or the core room.

For making mixtures, they have a Sellers centrifugal mixer, mounted upon a portable truck and driven by an electric motor, which can be taken to any part of the floor and located adjacent to the chute through which the sand is to be delivered, thus reducing the handling to a minimum.

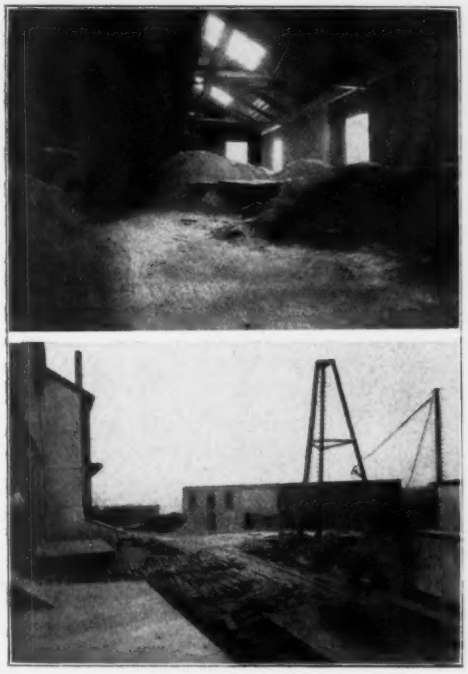
Melting Equipment.

The melting equipment consists of two cupolas, one 48 inches and the other 72 inches inside the lining. In remodeling the foundry, the cupola charging floor was raised about four feet, so as to give a greater distance between the tuyeres and the charging floor, and this resulted in considerable economy in melting. The pig iron, coke etc., is stored in the foundry yard or in bins adjoining the foundry and is elevated by an elevator located at one side of the charging room and closed in with



CORE DEPARTMENT.

corrugated iron. The most interesting feature, however, concerning the cupolas, is the method of taking care of the drop. The cupolas are located upon cast iron posts running to a floor about 10 feet below the regular foundry floor. These posts are of large dimensions and firmly braced. The space about the cupolas is covered with grating. For the support of the bottom, a heavy cast iron girder extends across below the cupola at the foundry floor level. The prop for supporting the doors is located upon this girder. At the end of the heat this prop is removed and the drop passes into the basement below, where it is



1. SAND STORAGE. 2. FOUNDRY YARD.

quenched with water. In this position it is out of the cupola man's way and also out of the way of any one passing around the base of the cupola. The removal of the drop the next morning by the helpers does not interfere with the cupola tender in his work of daubing the cupola and getting ready for the next heat.

The charging elevator is arranged to descend to the level of the basement in which the drop falls and the unburnt coke is placed in barrows and elevated direct to the charging floor, ready for charging with the next heat. The cinder, iron, etc., is loaded into barrows, elevated to the level of the yard and taken to the cinder mill.

For the breaking of heavy scrap they have installed a very efficient drop weight, with a lift of 40 feet. It consists of a heavy tripod of timber, which supports the top sheave. The rope for hoisting passes down under one leg through a passage under ground to a small building adjoining the foundry. In this building is located a hoisting drum operated by electricity and controlled by an ordinary con-

1. BRASS FOUNDRY. 2. CLEANING DEPARTMENT.

troller so that the man operating the weight is located at a safe distance from it and at the same time neither he nor his machinery is exposed to the weather.

Handling Equipment.

As has already been mentioned, there are three cranes in the main bay of the foundry, one of 15-tons capacity, and two of 25-tons each. In the core department there is a 5-ton traveling crane and in the light work bay a 5-ton crane which also passes over the brass foundry. These 5-ton cranes have a span of

28 feet. There is an industrial railway track running at right angles across between the light gray iron and the brass floors, and also across the main bay of the foundry, which serves to take castings from either department out into the scratch house or cleaning room. The scratch house has a 25-ton crane of 40 feet span. The standard gauge railway track passes through the foundry yard, the scratch house, the erecting shop, and into the machine shop, and is used for transporting heavy castings from one department to another.

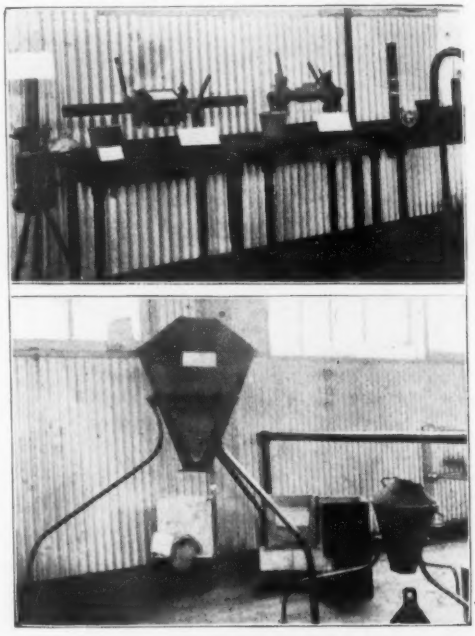
In the old equipment there were three cranes in the main bay of the foundry, driven by power, and they made such a noise that it was almost impossible for one man to make another hear upon the foundry floor and also jarred the building badly. The introduction of these electric cranes in place of the power cranes was certainly very acceptable to every one connected with the plant. The flasks, loam fixtures, etc., are stored in some building across the street from the foundry proper.

ALUMINOTHERMICS.

It is probable that all foundrymen have heard something of thermit, but few, if any, are aware of the many ways in which this new found aluminothermics process can serve us in our every-day work. The first question is: What is meant by aluminothermics? We all recognize immediately the portion of the word aluminum and also know that thermit relates to heat. To understand what thermit is requires a little knowledge of aluminum and also of the manner in which the metal is manufactured. All reactions or changes which take place in nature are accompanied by either the absorption or liberation of heat. For instance, chemically pure sulphuric acid can only be made by subjecting the crude acid to great heat and driving out the last of the moisture. This results in an unstable compound which has a great affinity for moisture, and if you add water to the concentrated sulphuric acid the mixture immediately becomes hot. In fact, it is not safe to add water to concentrated sulphuric acid, but if a mixture is desired, the acid must be poured in a small stream into the water, while the water is being stirred to prevent an explosion. This reaction is familiar to all foundrymen who have used sulphuric acid for pickling castings.

In like manner, in the making of aluminum, the process requires a great deal of heat and much of this heat disappears or is absorbed by the metal during its manufacture.

Aluminum oxide is formed with the liberation of a great deal of heat, but, unlike iron, the aluminum will not oxidize at all temperatures to any great degree. If, however, the reaction is started at a high enough temperature it will continue. The reaction of the aluminum thermit depends on this ability of aluminum to give out heat as it combines with oxygen, and, in fact, its desire for oxygen is so intense that it will rob it from other compounds. Thermit is the registered trade mark given to a mixture of finely divided metallic aluminum and a metallic oxide. Usually this is iron oxide. If a small spot on the thermit can be heated to a sufficiently high tempera-



VIEWS AT THERMIT EXHIBIT AT ST. LOUIS. 1. MOLDS FOR PIPE WELDS. 2. SMALL CRUCIBLE ON THE RIGHT AND SECTION OF A LARGE CRUCIBLE WITH CHARGE IN CENTER.

ture it will start a reaction between the aluminum and the iron oxide which will go on and pass through the entire mass. If the constituents are mixed in the proper proportion, the aluminum will be burned to aluminum oxide by extracting its oxygen from the iron oxide and the iron will be left in the pure state, which is really a very low carbon steel, running in the neighborhood of 1-10 per cent carbon or less.

The heat generated by this reaction is very intense, being above that of the electric arc, and it results in a very fluid and thoroughly melted mass. Being at this intense heat and

free from impurities, the metal subsides into a quiet state very quickly so that it can be cast.

This, in a word, is a description of what thermit is, and it all sounds very simple, but there are many uses to which it can be put and in its control and use there are many things which must be observed if success is to attend one's efforts.

Probably the most extensive use to which thermit has as yet been put is in the mending of castings and forgings by burning or welding the parts together. For instance, if the broken pieces of a connecting rod are placed close together and the melted thermit steel poured between the surfaces, it will heat up the surfaces to such an extent that the thermit steel will unite with the pieces, resulting in a perfect weld. Of course it is necessary to remove a half inch or so of the metal from the broken surfaces in order to allow space for the thermit steel to flow through, and to solidify between the ends without increasing the length of the rod. As in other burning on operations, it is always best to flow some of the metal through to heat the parts before the metal which is actually to form the weld comes into the mold. In other words, the mold must be so made that the first metal flows to waste. Owing to the very great heat of the thermit steel, the molds must be made like molds for the highest grade of steel castings and the face finished with a silica or silica and plumbago wash. The molds must be dried in an oven and heated slowly to red heat, so as to expel all traces of moisture.

In the accompanying illustrations several examples of thermit welds are shown. Fig. 1 shows a weld made in a shaft, showing the mass of metal in place before the gates and risers were cut off. Fig. 2 shows a weld in a connecting rod after a portion of the surplus metal has been machined away.

Probably the greatest triumph gained by this class of work has been in the welding of work for large vessels which has enabled them to make repairs quickly and get to sea at once.

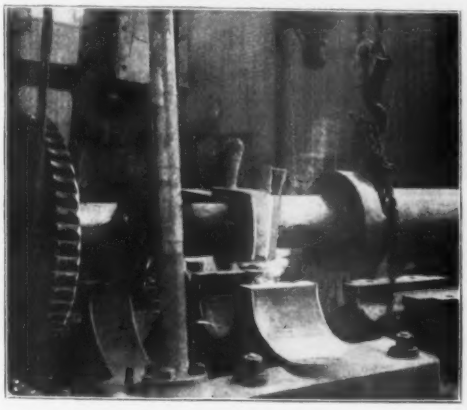


FIG. 1. THERMIT WELD ON A SHAFT.

Figs. 3, 4 and 5 show three views of the welding of a broken stern post of a large ocean going steamer. In Fig. 3 the break is shown.

FIG. 2. WELD ON A CONNECTING ROD.

In Fig. 4 the mold is shown in place about the stern post, and the crucible for the thermit reaction supported above the mold, while in Fig. 5 the stern post is shown with a mass of thermit steel cast about it, forming a weld.

Owing to the intense heat of the reactions

FIG. 4. MOLD FOR WELDING STERN POST.

no ordinary crucible would withstand them, and as a consequence, specially designed crucibles have to be used for melting the thermit steel, or in other words, for carrying on the thermit reaction. The crucibles are conical in section and are lined with a special magnesia compound. The general arrangement of a crucible fitted up for a reaction is shown in Fig. 6. The bottom is broken away to show the tapping arrangement. The crucible consists of an iron shell with a magnesia lining and a sheet iron covering hood to prevent spattering during the reaction. In the bottom is placed a small iron tapping bar above which there is a sheet iron disk covered with a piece of asbestos and a small amount of fire proof material tamped in above it. After the reaction has taken place and the contents of the crucible subside, the tapping bar is forced in so as to force the plugging material in the bottom of the crucible up. The intensely hot iron which flows out at once is sufficient to melt the tapping bar and carry it into the mold with it. It is an interesting fact that this steel can not be poured over the lip of the ladle if any of the slag is allowed to go first, on account of the fact that wherever the slag touches it will stick and will prevent the steel from adhering to any surface covered by the slag. This is the reason that bottom tapping has had to be resorted to in the thermit process. In doing repair work, particularly in the case of large work, the steel must not be tapped at too high a temperature and in order to bring it to the right temperature it is the usual practice to mix a small percentage of soft steel punchings into the thermit in the crucible and allow them to melt before tapping.

In this way metal of the required composition is obtained and of a temperature suitable for welding or casting operations. By this process teeth can be burned into cast steel gears in place of those which have become broken out, or any steel casting or forging can be mended when broken.

The process has been applied very extensively for the bonding of street car rails for producing a continuous rail, and in fact it is probable that more thermit has been used for this purpose so far than for any other purpose.

In the manufacture of steel, the ingots frequently form what is commonly known as a pipe at the top. This is a large shrink hole as shown in Fig. 7 and may at times occupy nearly one-half of the ingot. In order to avoid this piping effect, the thermit reaction has been used to heat up the top of the ingot just before

it became solid and thus bring the steel into such a condition that the gas could escape readily and the metal become solid. Fig. 8 shows the steel ingot with a can of thermit introduced

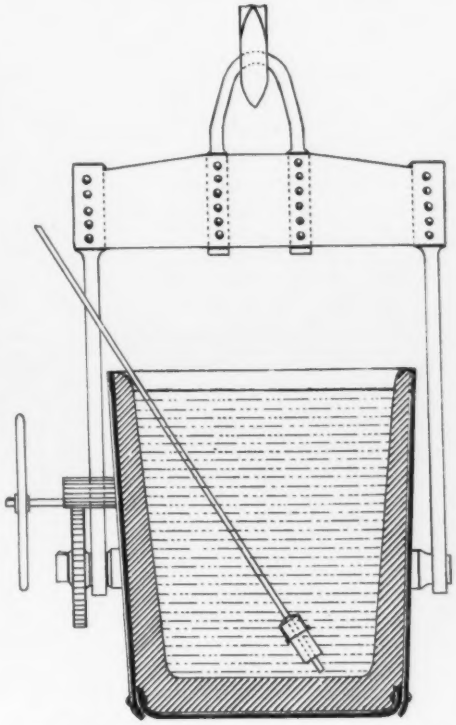
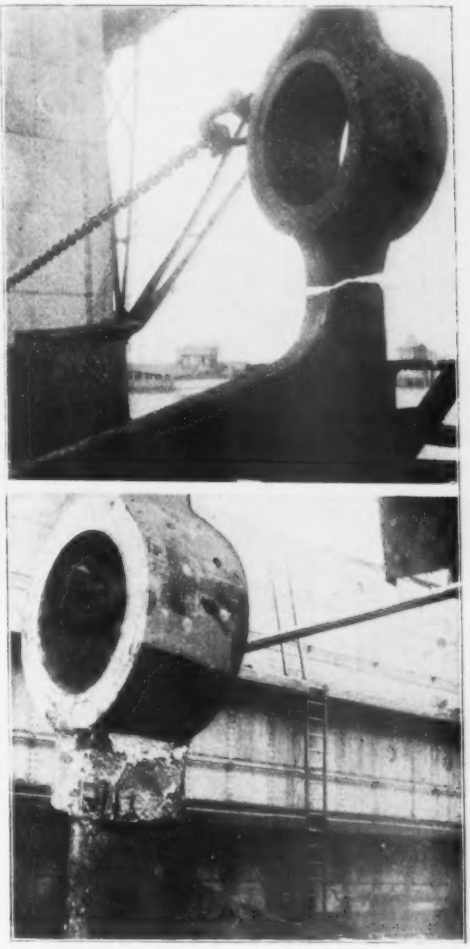


FIG. 10. INTRODUCING THERMIT IN THE LADLE.

into the top. The temperature of the steel is sufficiently high to ignite the thermit and the thermit will heat up the upper portion of the ingot to such a temperature that the gas will escape readily and the hot steel feeds down and fills the shrinkage cavities as they occur, so that the resulting ingot will only have a few small holes at the top, as shown in Fig. 9.

In like manner thermit can be used for heating up the risers of either steel or iron castings. In the case of steel castings the thermit is simply dropped into the riser and the heat of the metal is sufficient to ignite it. The reaction of course sets free the thermit steel at very high temperature, which mixes with the other steel in the riser and raises it to a very high temperature, thus keeping the riser open longer, increasing its capacity to feed the castings and also permitting the use of very much smaller risers.



3. BROKEN STERN POST. 5. WELDED STERN POST.

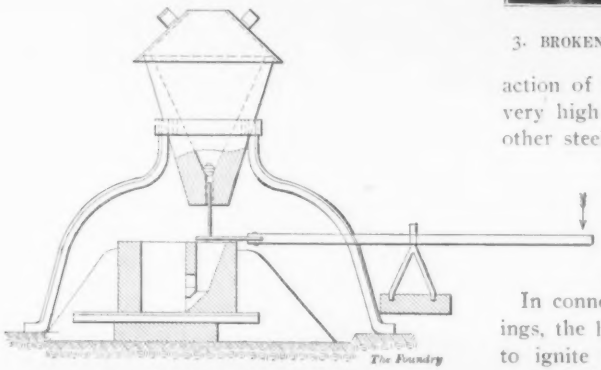
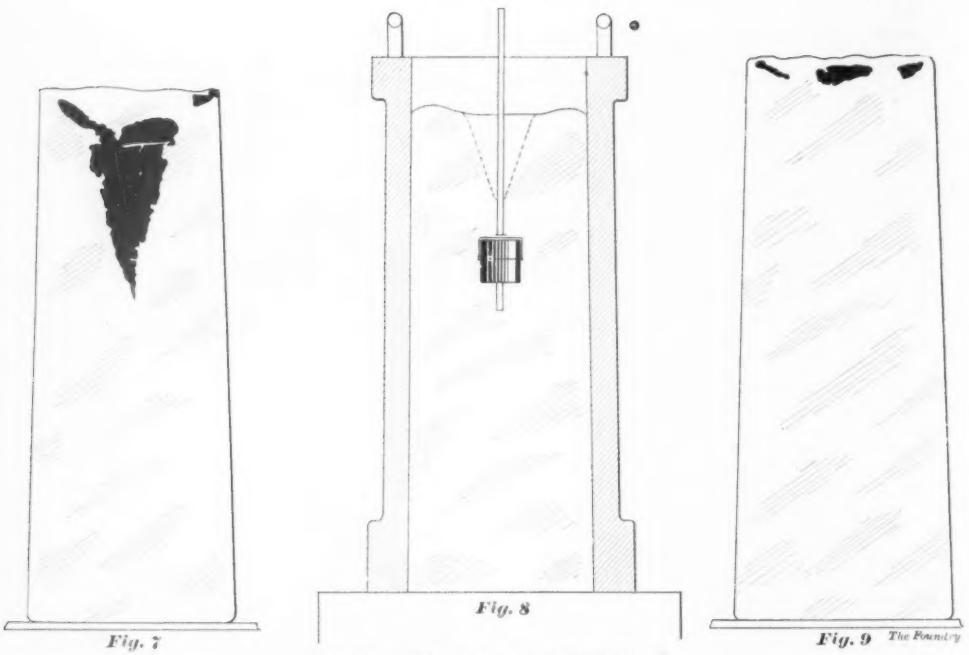


FIG. 6. CRUCIBLE AND MOLD.

In connection with the risers for iron castings, the heat of the cast iron is not sufficient to ignite the thermit and as a consequence some ignition powder has to be introduced to



USE OF THERMIT TO PREVENT PIPING.

start the reaction. The thermit steel then alloys with the cast iron, increasing its temperature and assisting very greatly in the feeding of the castings. Thermit has also been used for introducing materials into cast iron,—for instance, titanium thermit is made, which is composed of a mixture of iron and titanium oxides with aluminum. By introducing this into the foundry ladle by securing the box containing the thermit to an iron rod and thermit into the ladle has a tendency to make the temperature too high, and, as a consequence, the nickel thermit is ignited in a separate crucible or ladle and then poured into the large ladle. A box of titanium thermit is then introduced into the ladle, as shown in Fig. 10, so as to have a poling action which will stir up and mix the metal thoroughly.

In any case in which a box of thermit is introduced into a ladle of iron it is necessary

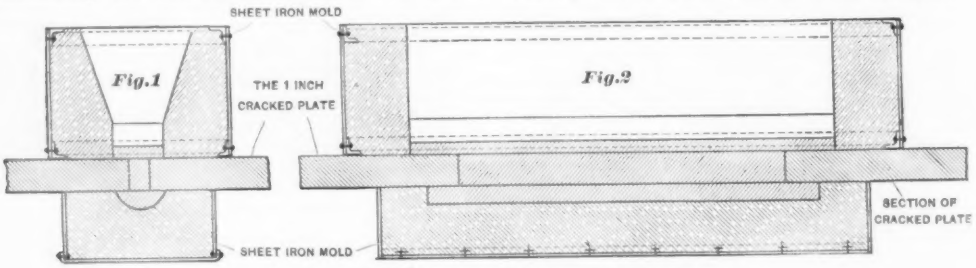


FIG. 11. MENDING A PLATE WITH THERMIT.

forcing it down into the metal as shown in Fig. 10, the reaction can be made to take place near the bottom of the ladle. This has a double effect. First, the thermit reaction causes a violent agitation of the ladle, which thoroughly mixes the metal, and as the titanium iron alloy is set free by the reaction it is mixed throughout the entire body of iron in the ladle. In making a nickel alloy it has been found that introduction of the nickel to have some ignition powder inside of the box to start the reaction.

The thermit reaction has also given to the foundryman another important product in the shape of pure metals. By mixing oxide of chromium with powdered aluminum and igniting the same pure metallic chromium free from carbon can be produced and this is now being manufactured and used quite extensively in the making of certain brands of steel. Pure

manganese, free from carbon, is also made in a similar way and used for making manganese bronzes. Other metals are made in like manner, and the fact that they are free from carbon makes them available for producing many alloys which it has been impossible to produce in the past.

For welding a hole in a plate, a mold may be made like that shown in Fig. 11 and attached to the plate. The thermit steel is then poured into the top of the mold so as to form what might be called an oblong rivet, with a conical head on one side and a flat head on the other, but instead of being simply a rivet, it is a mass of steel welded firmly into place in the plate.

A JOB SHOP PINION JOB.

BY WILBER.

A pattern shop is not really part of a machine shop. It is even farther from it than the foundry is, and we all know that the molder and the machinist are built on entirely different lines.

Sometimes the foundry is started first, and it has to have a pattern shop to help it out, for even the most daring molder cannot get along entirely without patterns, although some of them can produce castings that the patternmaker would never recognize as being made from his patterns, so the pattern shop might sometimes be classed as part of the foundry, and there might be cases where the foundry might be claimed as part of the pattern shop.

Whatever the arrangement may be, it is sometimes hard to determine just where and how to draw the line so as to know whose authority goes the farthest in the pattern shop.

It is natural for the man in charge there to think that as it is his trade he knows more about how things should be than anyone else does, while the boss molder is apt to think that as he is responsible for the quality and the quantity of the castings he should have the say as to how the patterns for them should be made, and at the same time the man in charge in the machine shop sees that all of the faults of the castings are added to his other troubles, and it would be as well if he had it in his power to cut them off before they got to him, and of course to do this he should have charge of both the foundry and the pattern shop. All this is supposing that the machine shop, the foundry and the pattern shop all belong to the same concern.

From the foregoing it can be understood that it seemed a very natural thing for Billy, who was really foreman of the machine shop, to have more or less business in the pattern shop. The pattern shop was just upstairs over part of the machine shop, and it was very easy to get up there whenever anything was wanted.

The shop was not very large, the foundry was smaller than the machine shop, and as the pattern shop was in proportion it was still smaller.

In times of great prosperity two men worked there, in ordinary times one, and very, very often there wasn't anybody working there. As there were also frequent changes in the foundry force, it fell to the lot of Billy to keep track of the patterns that were made for the outside jobs, and thus it very naturally came to pass that he sort of took hold of the pattern shop. I must admit that he did not look on patternmakers as a class with the same sort of feelings as he did on the denizens of the lower regions where he held sway, but he came to know and recognize the man who could take some wood and get it into shape so that it would not warp or go to pieces under the first vigorous assaults of a man who pounded sand with more muscle than brains. He also recognized that it took a lot of time to do this. He knew the man who would jump at the job in a hurry, would never get it right the first time. He was well acquainted with the one who was so afraid of getting things too small that he allowed double shrinkage and then a little, "so that the machine shop would be sure to have enough finish, for you can take it off easy enough, but you can't put it on." There were many types, and standing out plainly among them was Jack.

Jack was remarkable for many things. He had remarkably good judgment, and he was remarkably cranky, and it was remarkable how cranky he could be without being really disagreeable. He could do as good work as the best, and he could do the cheap, one casting job in a way that was a delight. One very capable foundry foreman said he could tell one of Jack's stock patterns as soon as he saw it because of the way they all stood up and stood use and abuse. He said that they were in a class by themselves in this place, and as gooc as any he had ever seen. As he had served his time in Great Britain and been in charge in several large shops doing good work in this country, he should know a good pattern when he saw it. Billy knew something about Jack's ability to do work quickly from personal experience.

On one occasion the "old man" had been

crowding Jack harder than usual for some patterns that were wanted in the foundry, and in the midst of the crowding a job came in from a sawmill and to get it out it was necessary to make a new pinion. Besides having some teeth broken out the old pinion was very badly worn. A pattern would have to be made and it was eleven o'clock.

"Here, Billy, you push this job through and see that it is ready for the morning train," remarked the Old Man, as he turned the job over. "And get that pinion upstairs so that it can be fixed up so that you can get a casting from it."

Billy knew enough about molding to know that no molder would undertake to get a casting from that thing, he also knew enough about Jack's temper to know that it was entirely possible that he was in for a row with that individual if he was not careful.

Taking the casting, he walked up to Jack with, "Hello, Jack, are you doing anything these days?"

"Am I!" exclaimed Jack, with a contemptuous snort.

"You usually are taking it very easy, as though you were afraid the work would not hold out," remarked Billy sort of careless like, and then added as though it had just come to his mind, "Here is a little job that the Old Man sent up. He wants a new pattern for this pinion and I must have the casting for tonight, or I can't finish the job, and it is promised for tomorrow morning."

Jack looked at the pinion and then at Billy without stopping the work he was doing, and then burst out: "What do you take me for, anyhow? I promised the Old Man that he could have this job by two o'clock, and I intend to work right through the noon hour so that he can have it. The molder is all rigged up and waiting for it, and I am not going to stop for any sawmill in the country. Why in the dickens didn't that fellow come in and order a pinion before that one gave out?"

Billy laughed as he said, "I knew well enough that you couldn't get a pattern ready today for this pinion. The Old Man must have thought that he was talking to the machine shop. You know that machinists *can* hurry once in a while."

Jack evidently believed that words of his could not express the contempt he felt for machinists and kept still and Billy went down stairs.

About five o'clock he went back upstairs so as to give Jack any information he might want in regard to the pinion.

"Say, is there going to be any trouble about your getting that pinion pattern done so that I can get a casting tomorrow night?" he asked. "I don't want to have to work the next night, as I have other business on hand."

"What is the matter with the pattern that I did make?"

"Nothing that I know of, but I want a pinion pattern. I don't know what you would call that thing that you were working on when I was up here before dinner."

"Well, it is done, even if you don't know what to call it, and so is the pinion pattern that you have been yelling for. You ought to have the casting in the lathe boring it out by this time instead of wasting your time up here keeping me from work."

Billy looked at Jack in doubt for a minute to try to see just what he meant, and then thinking that there might be something in his talk started for the foundry. Sure enough there was a casting just being dragged from the sand. It was not a bad casting either.

Jack had seen at a glance that it would be useless to make a very nice pattern. From the way the old pinion was worn it was very evident that the gear it went with could not be in very good shape. He had taken a piece and turned it to the size of the bottom of the teeth, giving it enough taper to draw. He had planed up a long strip into something like the shape of a gear tooth, and cutting pieces off to the right length for teeth had tacked them on. The pinion was the proper diameter on the outside and at the bottom of the teeth, and the teeth themselves were projections that would hold against other projections. "But don't you," said Jack, "be dumb enough to think that you will ever be able to get another casting from that pattern."

The pinion was about seven inches in diameter and the teeth were one inch pitch, and the most surprising thing about the whole job to Billy was to find a patternmaker who could see just how poor it would be safe to make a job and still have it do its work, and would then have the nerve to do it that poor.

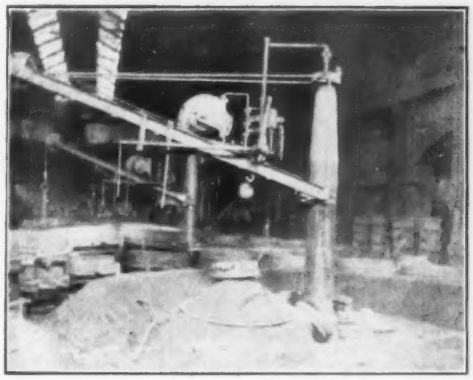
And that pinion did its work just as well as if the pattern had been made of mahogany and each tooth had been worked up to the correct theoretical curves.—*The Patternmaker.*

The Rempis & Gallmeyer Foundry Co., of Grand Rapids, Mich., have elected the following officers for the ensuing year: President, John H. Rempis; Eric Duus, vice president; Christian Gallmeyer, secretary-treasurer.

A HANDY FOUNDRY CRANE.

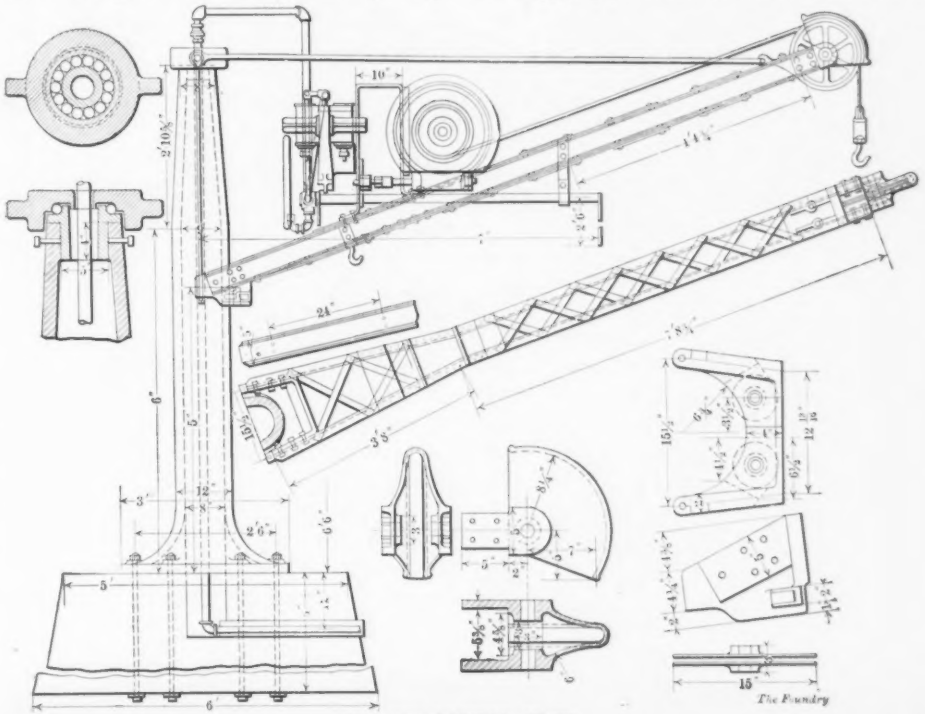
Many foundrymen have had to wrestle with the problem of a good post or pillar crane for use beneath traveling cranes. The accompanying illustrations show a very good solution of this problem. This crane is in use in the Roanoke shops of the Norfolk & Western Railroad. It was designed for handling car wheel flasks and molds as shown in the halftone. Formerly jib cranes reaching to the roof were used, but the installation of a traveling crane necessitated the design of a post crane under 13 feet in height. The boom of this crane will swing in 11 feet of headway, which is a necessary requirement in order that it may clear the bottom of the operator's cage on the traveling crane.

The accompanying drawings show the construction very clearly indeed. No guys are used, the cast iron central post being made very strong and secured to a large base composed of bricks laid in cement. The radius from the lifting hook to the center of the post is 12 feet and the crane has a capacity of 3,500 pounds. It is operated by a reversible two-cylinder oscillating engine, mounted on the boom and driven by compressed air. The boom is made up of structural shapes in the form of a lattice box girder and is supported by a cap on the top of the post which revolves on a ball bearing.



A HANDY FOUNDRY CRANE

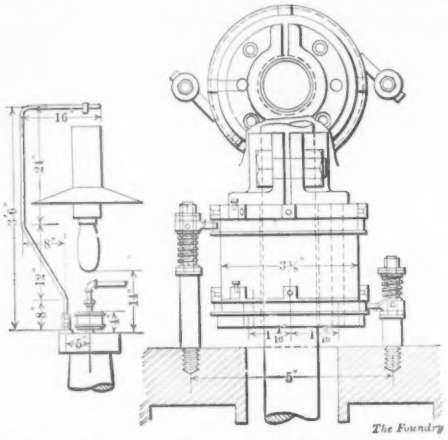
At the foot of the boom there is a casting carrying two rollers set vertically and arranged to revolve around the post. As the large traveling crane would interfere with suspended electric lamps, it was decided to place an arc light on the top of each post crane. These lights are supported upon standards bolted to the revolving cap and turning with it To avoid the twisting off of the wires two insulated connecting rings are mounted on the air supply pipe below the feed joint and the



A HANDY FOUNDRY CRANE.

current is taken from these rings to the lamp by suitable brushes and wires.

The worm gear hoisting mechanism on these cranes has been found very satisfactory in foundry work, on account of the fact that the motion can be closely regulated and the load stopped and held at any point. Each of these



DETAILS OF CONNECTIONS NECESSARY TO SUPPORT LAMP UPON THE CRANE.

cranes stands at the center of a circular narrow gauge track 12 feet in radius, upon which are situated the wheel flasks. Each floor will accommodate 20 flasks, the molding and pouring of which constitutes a day's work for one molder and helper.

The crane was designed by John Pilcher, Mechanical Engineer of the Norfolk & Western R. R. Co.

AN IMPROVED TEST BAR.*

BY J. F. BROWN.

There has been so much written and so many arguments used, showing the necessity of having a standard test bar for cast iron that nothing can be added to convince foundrymen that a test bar which will give all the information possible concerning the physical properties of the casting it represents is greatly to be desired. In the early part of this year a committee was formed, by the American Society for Testing Materials, for the purpose of deciding upon a set of specifications for cast iron. This committee proposed for adoption what they called the "arbitration bar," which, as you all know, is a bar 15 in. long and 1¼ in. diameter, cast on end in dry sand. Now, this bar was the result of much study and experiment by some of our very best foundrymen, and the universal adoption of it will go far toward placing the whole question of testing cast iron upon a fixed basis. The physical test is the final and most important one for all kinds of castings and any idea which may help to make that test more nearly perfect should be laid before foundrymen and thoroughly discussed with a view to its adoption.

Before we adopted the "arbitration bar" we used to take four separate tests from each air furnace heat, one each for chill, chemical analysis, tensile test and shrinkage, paying no regard to transverse strength and deflection. Now with the "arbitration bar" we could get transverse, tensile and chemical tests, but not shrinkage and chill, and to get these very important points of information I introduced what I venture to call an improvement on the "arbitration bar." We have used this new bar with great success for about six months and it is with the hope that it will be thoroughly discussed and tried in other foundries that I now present it to you.

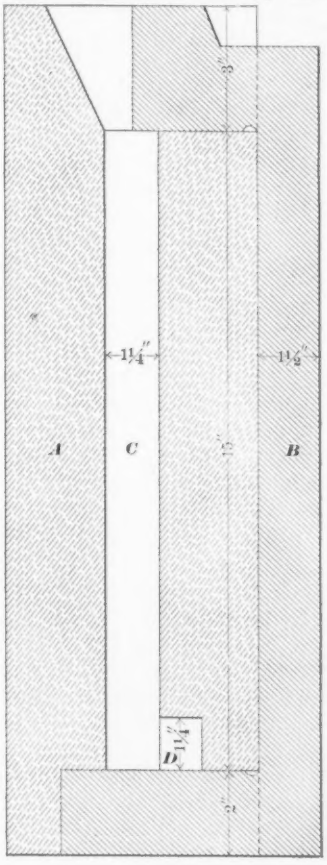
Taking it for granted that a bar 15 in. long and 1¼ in. diameter was all that could be desired with regard to length and section, we adopted these dimensions, then made a core A and cast iron yoke B, placed as shown in the sketch, and pouring it from the top we produce the bar C, which has a small projection D.

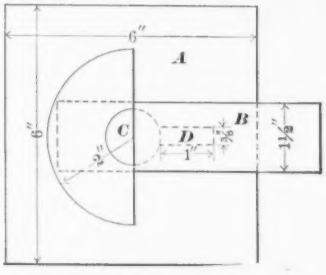
After cleaning the bar we knock off the projection and measure the depth of chill, then place it between the yoke in the same position as it was when cast, keeping it close to the top end, and measure shrinkage with a tapered scale graduated to 1-100 in. You will note that the bar being 15 in. long is 1-5 of the total length longer than one ft. To get the shrinkage per foot we deduct 1-5 from the shrinkage shown on the scale. This I found from actual measurements to be .02 higher than what appears in the casting, so that we consider .12 shrinkage to be .10 in the casting and therefore normal for general work. After measuring shrinkage the bar is broken on a Riehle machine, giving transverse strength and deflection; then one-half is turned and threaded according to standard specifications and tested for tensile strength in an Olsen machine. The other half is clamped on end in a jig and drilled in the clean broken section for the chemical analysis. Thus you see from the one bar we get shrinkage, chill, transverse

*Read at the monthly meeting of the Pittsburg Foundrymen's Association, Nov. 7.

strain, deflection, tensile strength and chemical analysis.

You will note from the samples of broken bars here shown the fine, clean, even fracture of the bars and also how solid they are—a result which I attribute to the dry sand core.



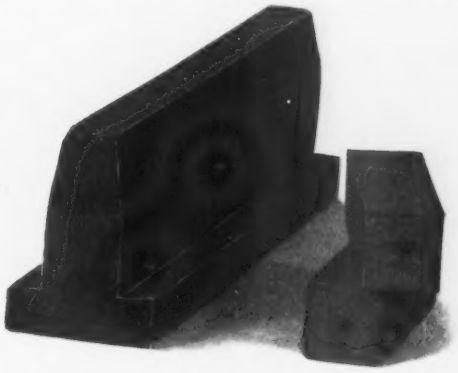


You will find that there are no signs of shot in the bars caused by metal falling on to the iron yoke. We have never had any trouble from this source all the time we have been using them. The only trouble we have ever had has been by pouring them when the iron would hardly come out of the ladle. Then there would be small holes in the bar. It is really surprising how cold the iron can be and yet produce a solid bar. We rub a little dry plumbago on the yoke where the metal strikes it, just enough to give a polish. The core, being made with a piece of ¼-in. cold rolled steel bar just twisted out and not rapped at all, is perfect as to size and no blacking is used to make it skin well because that would alter the size. The cost of these cores is small; a boy can run six an hour very easily.

By the use of these bars we are gradually accumulating some very valuable information which of course will be of use to us in the future, but it would be far better if other foundries in this district would adopt this bar and collect data to compare with ours so that we could establish standards of excellence based on accurate tests taken from our own actual practice.

PRISMATIC CORES.

The accompanying halftone shows two forms of prismatic cores which are of interest. The small square cores are about one inch



PRISMATIC CORES.

square and vented throughout as shown. The larger core is broken from the end of a long core made for T slots in planer beds. Both of these forms were made on the Wadsworth improved core machine. The planer bed core was made without vent, on account of the fact that the foundryman specified that it should be made in this way. Only those who have had experience in forcing cores through specially formed dies can appreciate the problem involved in making the T slot form shown and insuring a full, uniform core.

H. F. Kettler, of Dallas, Texas, has decided to erect a large foundry at Houston, Texas.

THE FOUNDRY.

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TRADE OUTLOOK.

The January number of *The Foundry* reported that the price of iron had been advancing rapidly, and as usual on an advancing market, foundrymen had been making haste to cover their requirements, and that most foundries were supplied with the amount of iron they would need for the first quarter, while the furnaces were pretty closely sold out for that quarter, and prices were still tending upward.

As we go to press the upward tendency has been checked by a slight easing up in foundry iron, but all parties feel that this was a good thing and may serve as a check to the rapid movement which might carry the price out of all reason, as has been the case many times in the past.

The lull in the market is due partly to the fact that the producers have little iron to sell and the consumers have little need of iron. Much of the recent buying has been for delivery in second quarter. The production of pig iron in the country is now at a rate of something above 20,000,000 tons per year, and during December the stocks of pig iron in the country were reduced by 120,000 tons. The steel industry throughout the country seems to be very active indeed, but this sudden increase has not affected all the foundries. The pipe foundries are busy, and the large foundries about Pittsburg, which are dependent on the rolling mills and steel works, are also exceedingly busy. The jobbing foundries throughout the country have more work than they have had in the past, but there is still considerable idle capacity.

The U. S. Steel Corporation recently purchased 25,000 tons of Bessemer pig at $15.50 per ton at a Valley furnace, which is 50 cents a ton under the price generally asked, but it is stated that most of this iron is held by speculators and will not affect the price greatly. The Southern blast furnace companies are holding firmly to the price of $13.75 for No. 2 foundry at the furnace and some are asking $14. Northern foundry irons have dropped so that No. 2 foundry is quoted at $16 at the furnace and in some cases less. The coke situation is also considerably easier than it has been for some time and more coke ovens are in service. Out of 22,711 ovens in the upper Connellsville region, only 1,724 were idle at last report, while in the lower region, out of 6,408, 399 were idle. With this large number of ovens active it has been possible to

break all records of production, and coke is now quoted at from $2.75 to $3 per ton at the ovens.

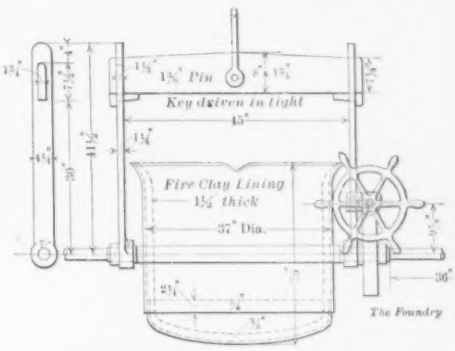
With the general picking up of the steel business throughout the country, the improvements which the railroads have in hand, and many additions which are being made, it is evident that the entire foundry business is sure to feel a revival. This year, however, at last year, the contracts for malleable castings have been placed more slowly than usual, and malleable foundries are not as busy as some other departments of the foundry business. This condition, however, cannot continue long with the railroad interests awakening and pushing their improvements as rapidly as they are at present.

THERMIT IN FOUNDRY PRACTICE.

In another part of the paper we publish an article on Aluminothermics, which is a subject that should be of great interest to foundrymen, as this new process has placed a powerful ally in the hands of the foundrymen for use in producing better and sounder castings from either iron or steel, or for use in mending or burning castings. Such revolutionary processes as this are usually slow in receiving the full credit which they should, and in many cases it takes men a long time to learn how these new devices can serve them, but we know that many of the leading foundries throughout the country are using considerable quantities of thermit and are finding it very useful.

A THREE AND A HALF TON FOUNDRY LADLE.

The enclosed sketch is of a three and one-half ton ladle, which can be made very cheaply with such material as is generally found around a railroad shop. The ladle is 37 inches diameter inside, and is made of ⅜-inch tank steel, with a dished head in the bottom. It has a ring 3½ inches wide by 1 inch thick at center, gradually thickened up at the sides to 1½ inches riveted to it. The arms are welded to this ring, which forms a shaft for the upright bars and also serves as guides to steady ladle. A removable hand wheel is attached to a worm, which is fastened by a bracket to one of the uprights and meshes with a gear on the shaft. This ladle has each side belled to form a spout for pouring and has a lining of fire clay 1½ inches thick; it can be adjusted to a nicety and the extra amount of weight on one side caused by the hand wheel, worm and gear, does not amount to enough to throw it out of balance. This ladle has been in opera-



A THREE AND A HALF TON FOUNDRY LADLE.

tion for over ten years, and, outside of renewing lining, has not cost one cent for repairs.—G. E. Lee in *Railway and Locomotive Engineering*.

THE BRASS WORLD AND PLATER'S GUIDE.

The above is the title of a new publication which has recently been brought out by the well known writer, Erwin S. Sperry, who for many years has been editor of *The Metal Industry*. Judging from the initial number and from Mr. Sperry's well known ability as a writer along these lines, we feel that the brass trade is to be complimented upon the fact that such a journal has been brought into existence, and we certainly wish it every possible success. The initial number contains 36 pages of very interesting matter concerning brass and alloys. As stated in the announcement, the paper is intended to cover the metallurgical field, including the alloys and metals used in foundry practice other than iron. The subscription price of the new paper is $1.00 per year and it is published in Bridgeport, Conn.

The stockholders of the Forsythe Pattern Co., of Youngstown, O., have elected the following directors for the coming year: John Stambaugh, Jr., George J. Renner, W. H. Rudge, W. H. Park and Frank Runser. At the meeting it was reported that the company's business was in very good shape.

The American Foundry Co., of Industrial Heights, Toledo, O., has elected the following officers for the coming year: President, M. Wolf; vice president, I. Gerson; secretary, Elmer Gerson; treasurer, Dr. C. H. Dills; superintendent, Phil Metzger.

RADIATOR COSTS.

BY R. W. M'DOWELL.

A radiator plant furnishes an excellent illustration of foundry cost accounting, inasmuch as the same kind of castings are made day after day, and it is therefore possible to figure accurately on the separate cost of all radiators as well as the cost of the whole output. In the radiator business it is of the utmost importance to keep minute and accurate costs, as competition runs close among the independent manufacturers of this class of goods, who are forced to be ready at all times to meet a reduction in price by the major concerns, and must have a positive basis on which to figure It is therefore necessary to keep reliable cost records, and to have them in such shape as to provide the required information at regular periods. In most lines of foundry business, daily costs are not practical, and the radiator business being no exception, it will be found advisable to attempt monthly costs only.

DAILY FOUNDRY REPORT

Date 7/12/04

Material	Quantity	Check
No. 1 Pig Iron	16800	✓
No. 2 Pig Iron	25719	✓
No. ___ Pig Iron		
No. ___ Pig Iron		
Stove Scrap	14560	✓
Machinery Scrap		
Miscellaneous Scrap	2414	✓
Shop Scrap	2411	✓
	59794	
Remelt	10682	✓
Total Iron used	70416	
Coke	13360	✓
Limestone	400	✓
Fireclay	48	✓
Molding Sand	1194	✓
Facing	46	✓
Chaplets	8	✓
Other Supplies		

Foreman

FORM 2. *The Foundry*

The prime features of any cost system are the amount and cost of material and labor. The cost of labor can be ascertained exactly, and it is possible, by exercising care in weighing and measuring, to get the exact cost of material, or at least to get it so close that the difference will amount to little.

A radiator plant will be made up of a number of different departments, comprising the foundry, core room, cleaning room, store room, machine shop testing, finishing and assembling departments, and shipping or stock room. It depends largely on the size of the plant and the volume of business it is doing as to how the accounting should be done. If the plant is large enough to warrant it, and employs a large number of men, it is best to run each as a separate department, charging it up with all supplies, material and labor used in or expended for it. This is not necessary, however, in a moderate sized plant, and the most satisfactory plan in such a plant is to run the core room and the pattern shop, if there is one, in this way, treating the other departments in the ordinary manner.

The present example will deal with a factory turning out between 7,000 and 8,000 ft. of radiation per day, in all styles, single, two, or three column, in both the steam and hot water varieties. Radiator shops do not, as a rule, turn out much job work, except such shop castings as they may require for their own use, such as clamps, flasks, rattler staves, ladles, etc., so this feature will not be considered, descriptions being confined strictly to the cost of radiation proper, and the costs being figured with this in view. The first item to be considered is material.

The most important material used is, naturally, the iron. This is kept in separate piles, the various grades of iron being plainly marked and no two different grades being allowed to become mixed at any time. When an order is made and sent for any quantity or kind of iron, a sheet like Form 1 is made out, and filed for reference. As the invoices come in, the car number, initial, weight, etc., as shown by them are entered on this sheet, under the "Invoice" heading, and when the corresponding cars come in, they are entered up in the same way under the "Shipments Received" heading. The other columns are used to keep track of the balance due on the order after each shipment is received. This method enables the manufacturer to keep strict account of what iron is coming in on the various orders, how much is still due, and whether the shipper is living up to his contract or not. If there is any discrepancy between the actual weight and the weight as shown by the invoice, it shows up at once, and a claim can be put in immediately. Sand, or any other ma-

terial which comes on orders of such size that they cannot be shipped complete, may be treated in the same way. When an order is filled, the sheet may either be destroyed or filed away for future reference. It is frequently an advantage to have these sheets filed, as they may often give information about shipments that could not be obtained elsewhere, and which is of value in placing future orders.

The starting point of foundry costs is, of course, the cupola. Each day the foreman fills out a report like Form 2 and turns it in to the office. This report shows the amount of iron, coke, limestone fire clay, etc., that have been used, and is carefully checked over, in order to make sure that these amounts are correct. Rejected castings are charged in this report at scrap value and credited in the same way, but the value of remelt is never either charged or credited in the costs, although the amount of it is figured in the heat. The reason of this is that the remelt should, and does in a well regulated radiator foundry, run practically the same every day, so it is therefore entirely unnecessary to charge and re-charge, credit and re-credit it. These reports first go to the stock-keeper, who enters the amounts of the various materials on his sheets, and are then filed away. The Monthly Foundry or Cupola Report, Form 3, is made out from the stock records. It shows the total net cost of the iron which has been used during the month, as well as the cost of coke, limestone and such materials, and leaves the items in good shape to be entered on the cost sheet.

CUPOLA REPORT FOR MONTH OF July 190 4

Material	Kind	Amount	Total	Perct	Cost
Pig Iron	#1	1104196		34.8	
Pig Iron	#2	598641		34.6	
Pig Iron	#3	36218		3.	
Pig Iron					
Stove Scrap		361116		20	
Machinery Scrap					
Shop Scrap		8114		.5	
Rejected Castings		60237		3.6	
		1484842		85	
Remelt		233895		13.5	
Total Charge		1718737		100	
Radiators		1345764			
Job Castings					
Shop Castings		16015			
Rejected Castings		61736			
Total Castings		1423515			
Melting Loss			5%		
Coke		334618			
Limestone		10870			
Fire Clay		16778			

FORM 3. The Foundry

Sand, coke, limestone, fire clay, facing and similar materials are used by the foreman as needed, being reported daily after having been carefully weighed. Other supplies are issued on requisitions to the store-keeper and all material is accounted for on the stock records, from which the amount of material used is obtained monthly, and entered on the cost sheets. Material and supplies for special orders outside the regular product are not figured in with the regular cost sheets, but is kept track of separately, on a different sheet, which sheets are filed in a separate binder.

Labor.

In nearly all departments of a radiator plant, the labor is run on the piece work plan. This plan has many advantages, one very great advantage being that by paying a certain price each for making any piece, part, or section, it is possible to get the exact cost of this part, this being almost impossible when work is being done at a certain rate per day. Molders receive a certain fixed price for each different kind of radiator section, and it is desirable at all times to keep the molder on the same pattern without change, if it is possible. Shaking out at night is also done at a fixed price per floor in most cases, although some concerns adopt the plan of letting out this work at a certain price to one man, allowing him to hire his own help. This plan has been found to work in a most satisfactory manner, not only for shaking out, but also in the cleaning room. Unless this plan is used, the cleaning room will be run by day work.

After the radiator sections pass through the cleaning room, they are piled up by the testing benches, great care being observed to keep the different days' heats from becoming mixed. They are here subjected to rigid tests, and any sections that are imperfect or cannot be repaired or "plugged" are thrown out. Each

Name _____ Address _____ Order No. _____ Date _____

Kind of Iron _____ Amount on order _____ Rate of Shipment _____

Invoice				Shipments Received					Shipments	Total	Balance
Date	Car No.	Initial	Amount	Date	Car No.	Initial	Amount	Differ.			

The Foundry

FORM 1

PRODUCTION FOR July 12 1904

No.	Names	Letter	Size	Kind	No. Col.	No. Up	Diset	Good	No Feet	Pct.	Wt. Ea.	Total	Rate	Amount
4	Wilgus	D	38	Steam	2	32	2	30	120	05	28	840	7	2 10
78	Lewis	K	38	Steam	2	31		31	124	00	-	868	7	2 17
	May (Belgray)													1 50
116	Hearne	M	38	Water	2	20	1	19	76	05	-	532	7	1 33

The Foundry

FORM 4

PAY ROLL FOR HALF MONTH ENDING July 16. 1904

Department Foundry

Names	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total Hours	Total Sect.	Rate	Total Day Work	Total Pc. Work	Total Labor	Deduction	Amount Due	Productive Labor	Non Pro Labor
Wilgus	4	22	28		28	27	28	30	30	11		32	30	30	30	32	31			4 1/8	7		2 92 6	2 92 6	50 00	2 42 6	2 42 6	
Hearne	116	19	10		10	10	10	10	6	2		8	9	5	25	24	26		80	12 7	15		2 10 8 9			2 10 8 9	2 10 8 7	2
Lewis	78	30	30					29				30	3	32	32	28	30			27 2	8		2 17 6			2 17 6	2 17 6	
Belgray	149	30	32		31	30	30	25	30	31		31	27	31	32	30	18					1 10 0 0						1 20 0
Brown	11	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8		166		15	2 49 0		2 49 0		2 49 0		2 49 0
Hearne	116	10	10																20		20	4 0 0		4 0 0		4 0 0		4 0 0

The Foundry

FORM 8

tester turns in a card showing how many sections he has tested, and the totals of all of these cards must correspond with the total number of sections put up. The Production Sheet, Form 4, is made out at the testing department, and also a report of the sections thrown out. (Form 5.) A similar report to

REPORT OF RADIATOR SECTIONS DISCOUNTED IN CLEANING ROOM.

July 13 190

Letter	Size	Kind	No. Col.	Number	Wt. Each	Weight
D	38	Steam	2	2	28	56
M	38	Water	2	1	28	28
G	38	"	3	1	42	42
C	32	Steam	3	3	28	84
L	45	"	3	2	50	100

The Foundry

FORM 5

this is also made out daily at the cleaning room. The molder turns in cards like Form 6 giving the number of sections he has made, the style and kind, and his own letter or mark, and these cards, after having been O. K.d by the foreman, are turned into the office, where the production sheet is made up in triplicate One copy goes to the testers, to be filled in after the heat has all been tested, one is for the office, while the other is hung up in the foundry in a conspicuous place, so that each molder can see the result of his work and figure his time accordingly. The production sheet is a most important form, and will be referred to more particularly further along.

From the testing department, the sections pass to the various machines for grinding and finishing them, and from there to the presses where they are put up into complete radiators. The order sheet has a column used to show how many sections there are on the order, all

REPORT OF RADIATION RECEIVED INTO STOCK ROOM

July 12 190 4

Number	No. Sec.	Size	Kind	No. Col.	Tapping	Total Sec.	Applied to
11	8	32	Steam	2	1¼x1¼	88	Stock
20	12	38	"	3	1¼x1¼	240	" 1764
5	6	38	"	2	1¼	60	" 1204
6	6	26	"	3	1	30	" 1204
1	20	30	Water	3	1¼x1¼	20	" 1184

The Foundry

workmen on the nipplers, emery wheels, reamers and presses being paid by the section. A record is carefully kept each day of the radiators delivered to the shipping or stock room, and this record is checked with the orders as they are issued and completed. The other men working in the machine shop are paid by the day, their time being registered by means of a clock kept for this purpose. As many of these clocks can be used as will be found most convenient, according to the number of workmen employed, all employes, whether they work by the day or by the piece, being provided with cards on which to register their time on the clock morning and evening. Time cards of any kind, clock or piece work, should be of different colors, each department having its particular color for all forms used in it. This applies to orders, requisitions, etc., as well as to the time cards. If this arrangement is carried out, it will prove a great convenience, and will greatly facilitate making up the cost sheet. The report of radiators received into stock is turned in each day, and the sections placed to the credit of the press men. The grinders and finishers turn in cards showing what they have done for the

MOLDER'S TIME CARD.

Date July 12 4

Name James Wilgus No. 4

Size	No. Col.	Kind	Style	No. Up	Job Work
38	2	Steam	Alma	34	

The Foundry

FORM 6.

day, these cards being checked with the stock room record.

The Production Sheet.

The Production Sheet, as stated above, is one of the most important records that is kept in a system of radiator costs, showing not only the daily production, but also the time of the molders and helpers, and what the production costs in the way of labor. The names of the molders and helpers come first, followed by their letter or mark, the kind of work they are making, the number of sections put up, the number good, the weight, the number of feet and the percentage of loss of each man. When this sheet comes in from the testers with the number of good sections marked upon it, and the reports of sections thrown out come in, the office and foundry copies are made out complete, and the amount due each man put in the

proper column of the office copy. The percentages are also figured, and the foundry copy put up in a conspicuous place in the foundry, in order to give the molders a chance to figure out their time, and also to show who is doing the best work. This acts as an incentive to the men, and in some shops, a premium is offered to the molder having the best percentage for the month. When the timekeeper has entered up the molder's time from this sheet, it goes to the stock-keeper, to be checked with his records. It is then filed in a binder for reference. Owing to the importance of this sheet, it is well to have all the figures on it checked over by two clerks, in order to avoid all chance of mistake.

COST SHEET FOR MONTH OF _____ 190 ____ No. _____

	Quantity	Cost	Extension		Amount		Total		General	
Foundry										
Iron per Cupola Report										
Coke " " "										
Limestone " " "										
Fire Clay " " "										
Facing per Foundry Report										
Molding Sand " " "										
Chaplets " " "										
Other Foundry Supplies, per Stock Records										
Productive Labor										
Non-productive Labor										
Total Cost of Cores per Core Room Sheet										
Cleaning Room										
Total Foundry Cost										
Machine Shop										
Rods and nuts per Stock Records										
Nipples " " "										
Packing " " "										
Machine Oil " " "										
Engine Oil " " "										
Fuel										
Productive Labor										
Non-productive Labor										
General										
General Expense										
Repair										
Repairs to Patterns										
" " Machinery										
Maintenance										
Cost of Production										
Interest, Taxes, etc.										
Office Expense										
Whole Cost										
Cost of Production										
Cost of Job and Shop Castings										
feet Radiation @ per ft.										
Remarks										

FORM 9 *The Foundry*

The Pay Roll.

Form 8 shows the Pay Roll Book. A page in this book (or more than one page if required) is devoted to each department, providing columns for the total time, the amounts due for piece and day work, the total amount due, deductions and net amount due. Additional columns are provided for productive and non-productive labor. At the end of the month, when the cost sheet is to be made up, the totals of productive and non-productive labor in each department are found and entered in their proper places on the cost sheet

Pays should be run bi-monthly instead of every two weeks, this being more satisfactory where a monthly cost record is being run. A molder is not often changed from one pattern to another, but in case he works on two or more patterns during the pay, the number of sections of each kind can be entered in the "Sect." column, room being left there for two or more entries. This book, like the other

forms, is gotten up with a view to allow of checking with the stock records, etc., a system in which all forms, if correctly kept, will tally up one with another, being much more accurate and easy to operate than where the main forms are in a measure independent.

The Cost Sheet.

All material, time and stock records being now entered up for the month, the cost sheet is prepared. (Form 9.) This form is simple, providing for the amount and cost of material used during the month, obtained from the store room records and requisitions, and productive and non-productive labor, obtained from the pay roll. These items are subdivided by departments, and additional space is given for general expense items so the net cost of production is thus obtained. Below this is provided space for figuring in all other items of expense for the month, thus giving the total expense of running for the month. Below is a recapitulation of the cost, production, price per foot, etc. The production for the month is taken from the stock records, or can be gotten from the production sheet. If desired, a record may be kept of the separate cost of each style and kind of radiator that is manufactured. A record of this kind is best run on cards, and is merely a simpler form of the cost sheet. A card with a tab projecting to show the size, will be found most convenient, while the cards may be classified by style, kind, etc., by means of guides. It will also be found convenient to have all cards representing steam radiation of one color and water radiation of another color. A sample of this kind of card will be seen in Form 10. Space is given for all items entering into the manufacture of the radiator section, also space for comparison with the cost sheet. This record is, however, not necessary, though it will frequently be of very great convenience.

The cost sheet, however, gives everything that is required, without auxiliary records, and is entirely reliable, if care has been exercised in making up the various reports. It should be filed in a binder and indexed by means of adjustable index tags, so as to make reference quick and easy. This form, as well as the majority of the others shown, is made out in such a manner that a book typewriter can be used to fill it out in all places or offices where there is one of these most useful machines in operation, and if filled out in this way, as many duplicates as required or found convenient can be kept. Many concerns would require copies of the cost sheet in two or more departments, so making it out in manifold would be in many cases a great advantage.

With a system gotten up on similar lines to the one here described, in good working order and carefully kept, the management may feel that they have something definite to go on, and that the costs on which their prices are based are entirely reliable, and not mere guess work, or a blind following of their competitor's prices. If their goods are costing too much, they will want to find out where the trouble is at once, and the foregoing forms will be of great assistance to them in so doing, if intelligently gone over. The general plan of the system would, of course, have to be shaped to fit the needs of the business, but in the main it is thought that it will prove to be simple and practical for this line of foundry work.

Size ____ No. Col. ____ Style ____ Kind ____

Items	Cost	Comparison
Iron		Per lb.
Other Matl.		Per lb. Cost sheet
Shaking out		
Cleaning		Per foot
Testing		Per foot " "
Finishing		
Assembling		Whole cost
Pct. Genl. Exp.		Whole cost " "
Sundry		
Cost per section		
Cost per foot		
No. lbs. to ft.		
Cost per lb.		
Remarks		

Form 10

The Foundry

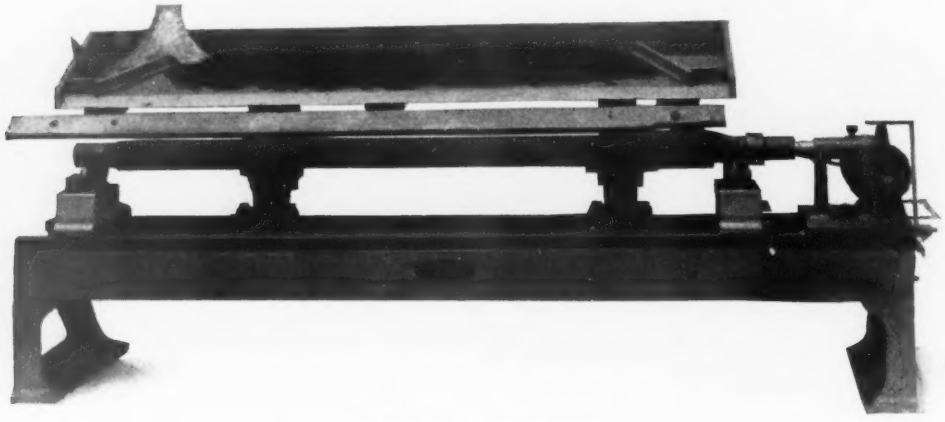
The William White & Sons Foundry Co., of Dayton, Tenn., will remove to Chattanooga, Tenn., where they will form a partnership with Messrs. Gibson & Love, of the Lookout and Mountain City Stove Mfg. Companies respectively, and will erect a new plant.

It is reported that The Newport Foundry & Machine Co., of Newport, Ky., will remove to Cincinnati and build an entirely new plant.

The Eureka Foundry & Machine Co., of Birmingham, Ala., has increased its capital stock from $5,000 to $50,000.

AN ENGLISH CORE MACHINE.

In this country most of the core machines now in use work on the sausage mill principle, and are used for comparatively small and short cores. Practically all pipe cores in this country are made from loam and struck up in the usual manner. In England a very interesting machine has been developed and is in use for making pipe cores. The machine is shown in the accompanying illustration. It consists of a revolving arbor upon which a sand core is made. The sand is fed to the core from a shelf or board and is pressed on to the arbor by a reciprocating bar arranged back of the arbor and beneath the sand board. This reciprocating bar or rammer, it is stated, will press the sand on to the arbor in about one minute. For pipes from 2 to 4 in. in diameter the coating of sand is 5-16 in. thick, for 6 in. pipes ⅜ in., and for 12 in. pipes ½ in. thick. The machine was patented by W. Jones and was made by Jones & Attwood, of Stourbridge, England.



AN ENGLISH CORE MACHINE.

When in use they make five or six different shapes or sizes or cores on one machine in a few hours, but the makers state that the most economical results can be obtained by using one machine continuously on one size. In this case in England the labor for an ordinary pipe core amounts to but one cent. They claim that the labor cost of cores made in this manner is about ¼ that of loam cores.

Perhaps the simplest description of this machine would be to call it a core turning lathe, but instead of reducing the diameter by a steel tool, as in an ordinary lathe, the reciprocating bar increases the diameter by fixing the sand on the core barrel itself. Manufacturers have expressed surprise that the sand should stick to the barrel, but by wetting it the sand adheres very readily. Another advantage claimed for the machine is that it is only necessary to temper or wet the sand to the consistency of ordinary molding sand and that a large proportion of old or burned sand which would be unfit for molding purposes may be used in the mixture. The makers have recently added another device to the machine which consists of a special hopper holding a sufficient amount of sand for one core, so that the operator can start the machine and then prepare the next core bar for work while the machine is ramming the first core.

AN EXPANSION PROBLEM.

BY J. F. BUCHANAN.

After reading the able paper by H. I., in the May issue, on "Green Sand Bottoms and Sound Castings," and Mr. Webb's comments in the June number, I felt disposed to add my quota to the discussion of the interesting problems raised in connection with the expansion of molds and metals. Being a brassfounder, my experience differs somewhat from that of both gentlemen; however, I quite agree with Mr. Webb's remarks on the expansion of cores. It will generally be conceded that the behavior of metals, particularly their expansions, has not been so minutely observed as some of the natural compounds,—water for example, in the form of ice, steam, or gas; and the same remark applies with equal force to our knowledge of alloys. Scientists tell us there is a point at which water reaches its

maximum density (about 39° F.), and it will expand if it is either heated beyond this point or cooled below it. Certain metals, as iron, antimony, zinc, bismuth, exhibit similar tendencies near to the point of congelation, but no precise announcement has yet been made with regard to them, although nearly every foundryman is aware of such phenomena from experience. Heat is said to exist in two different states in the same substance, viz.: sensible heat and latent heat. The former passes readily from one substance to another, affects the height of thermometer and is produced by the mechanical combination of certain elements. but the latter only becomes apparent by a change of the condition of the body from the normal temperature, hence it is called latent or concealed heat. In casting alloys the development of this latent heat is sometimes an important factor in producing expansion of the metal while it is cooling down to the solid state, oftentimes resulting in a porous casting. It is a common saying that a liquid cannot rise above its own level, but my experience with alloys makes an exception. Liquid alloys sometimes assume various densities, resulting in a series of liquation, forcing the eutectic alloys to the surface in the order of their fusibilities. When this sweating or "swelling" of the metal takes place in the head or risers of a mold, the molder instantly applies cold water to set the metal and keep the pressure on the casting until it is thoroughly set Some time ago I had an experience with four brass condenser tube plate castings which takes a deal of explanation. The plates in question were 42-in. x 33-in. x 1¼-in., and as they were only to be used as stays for the condenser tubes, any sort of brass was considered good enough. They were made from scrap and borings which I would estimate roughly to contain about 70 percent copper, 20 percent zinc, 8 percent lead, and 2 percent tin, with traces of iron and antimony.

The molds were dry sand, the pattern being bedded in the floor and a top part rammed up and staked in position. About ten minutes after the first one was cast, my attention was directed to the joint of the mold at the side farthest from the runner (there was no riser). The top part had risen about 3-16 in. at that side, but it appeared to be in perfect contact with the joint at the front and half-way round the sides. Now, if the joint had not been perfect when the mold was closed, there would have been a regular fin; or if the top box had been lifted by the pressure of the metal while the mold was being cast, there would have been a bad run-out. Neither of these things happened; yet the casting when it was turned out showed 3-16 in. more metal along one edge, tapering off to the correct thickness about the middle of the pattern. There was an *irregular* fin all along this thick edge, but it appeared as if it had sweated through the surface of the plate and was composed of the liquated metals. The mold and metal for the second of these castings being ready, I took the precaution, in weighting down, to *double the weight.* It was of no avail; the same thing happened; five minutes after it was cast you could pass the trowel blade right in between the joint at the back of the mold. I decided to make the two remaining plates in a pair of strong cast iron boxes so that they could be cramped together. When these were cast the metal in the head liquated or "swelled back" badly, showing that there are other things besides fluid pressure to be guarded against in casting alloys. The strange thing about this job was that after they came from the planing machine all four plates appeared to be equally solid. I had fully expected the first two castings to be spongy on the upper surface, but after seeing them machined I came to the conclusion that the alloy in cooling was only throwing off the excess of lead tin and zinc, to admit the formation of more homogeneous metal in the body of the material.

THE USE OF OLD CORE SAND.

BY CHAS. A. SMITH.

As there have been several inquiries concerning the manner in which I use old core sand in new core mixtures, I may give the following explanations. After the sand has been used it is still sand except that it is dry, while new sand is raw or moist. The firm for which I worked purchased a pan grinder to grind up old bricks that had been used in the furnace, and it was suggested that we might use this for grinding the old cores. I tried it by first introducing a wheelbarrowful of old cores, or say about 350 pounds. After I had shoveled this amount in I poured in one pailful of water to moisten the sand and ground it for about 15 or 20 minutes. The sand will then be as fresh as new, providing it has not been burned. I used three tons of old core sand over every day and have no trouble in the least with the cores. Care should be taken, however, to see that the sand is not

ground too fine, as this would make the cores too close. Oil should be used where old sand is employed and the cores well baked. The amount of oil to be used will have to be determined by experiment, on account of the fact that it depends largely on the style and size of the cores being made. When there are wires in the cores the grinding will free them and they can be picked out of the pan as it comes around.

The question has been asked as to how old core sand should be mixed with new. When first experimenting, I mixed a little new sand with the old and found that it was unnecessary to add any new sand providing the cores are not seriously burned, and I used three tons of old sand over every day without putting any new sand whatever with it. I also use seven tons of new sand each day for making other cores, or in other words, 10 tons altogether. The cores must of necessity be supported by prints and the sand in these prints is not seriously burned and it is from these portions of the core that I get most of the material to be used over. Ordinarily the entire core, prints and all, is hauled to the dump, but the firm would not stand any such wastefulness at present, even though it was their practice formerly. If the core sand is burned considerably I would advise adding one-third new sand, while if it is badly burned, I should advise one-half new sand. Almost every foundryman has some cores upon which he can experiment and I would advise beginning by trying the old core sand on such jobs. If any foundryman has any special difficulties, I should be very glad indeed to help him out and answer any questions, or if he wishes information as to how to use it for particular classes of work, if he will let me know what class of work he has to do I will be glad to give him the benefit of my experience.

Every superintendent ought to get acquainted with his core room foreman and give him credit for what improvements and additions he can make in the department, for the core room is certainly an important department and much saving can be made here by close attention to details. If the core room foreman, however, is opposed to the use of sand, it may be difficult to get him to make good cores with it. I enclose a duplicate of one of my daily reports, which will show that I used more old sand than any other kind.

Material used in core room, Oct. 22, 1904.

Magnesia	3,868	lb.
No. 4 Waterford	472	"
Lake	2,555	lb.
Old Core Sand	7,234	"
Sweepings	676	"
Ottawa	234	"
Mill Dust	326	"
Linseed Oil, 7 pails (3 gallons to pail)		
Holland Oil, 6 pails (3 gallons to pail)		
Coke	3,393	"
Wire	49	"
Wire	148	"

SOME FOUNDRY PRACTICE.

BY T. BEN BENNETT.

In the October *Foundry* I read with interest a short article on foundry practice, describing the making of two small malleable castings. I have a great deal of sympathy with the molder who has to produce light work and contend with dull iron. If the iron is hot, he can easily cool it, but he cannot increase its fluidity once it is cooled. Aside from the loss of castings from dull iron, I believe that in a majority of cases the molder is directly or indirectly to blame for losses. I can readily appreciate the fact that where men are working at piece work, they will avoid any work on the mold, such as venting, which they consider unnecessary; but if a number of molds are lost it is then the duty of the intelligent molder to examine the piece carefully to determine the cause, and take care that they are not lost from the same cause the second time. Had the molders in Mr. Karow's case been put at molding a large thin plate, they would undoubtedly have vented it, and we notice that when he finally put an old molder on the job, who was evidently a practical man as well as an old one, the first thing he did was to vent the mold. I have very little patience with the complaints of some molders when they lose their work. I have in mind one man who would look a pattern over in a masterly and superior way, find fault with the patternmaker, and then immediately and very quickly make a nice looking mold. Yet, when the work was cast, six times out of ten it would have to be made over again, and very often for the third time. It would have been amusing, had it not been so costly, to hear the reasons given for losing the work. Sometimes it was because the sand was too fine, the introduction of a vent would have relieved that; sometimes it was stated that the sand was too coarse and burned, when the real trouble was that the mold was cut from improper gating. When too strong a facing sand was used, with the result that the sharp edges and

corners were rounded, he claimed that the trouble was due to cold iron, although he had cooled the iron himself before he considered it fit to pour. If the flask strained or coped, the bars were too weak. Why did not he secure it properly before pouring? When this individual did succeed in making a good casting, which he did sometimes, it was his wonderful ability that produced it and everybody had occasion to know it.

As a rule this is the class of men who want the biggest pay, and know just how they would run a shop if they were the firm and the firm in their place.

I admit that very frequently we must use a finer sand than is satisfactory for the particular job, but the sand is there and cannot very well be changed, while the job must be made. It is in overcoming such difficulties as this that the intelligent mechanic shows his ability. The foreman does not need to be told that the sand is too fine, that the flasks are too light, and a little risky, for he knows all of these facts and expects the molder to exercise his ability, and if he cannot remove the difficulties to then consult with the foreman.

There are many cases in which the patterns are at fault, possibly being too light in some part, as in Mr. Karow's example, but the castings must be produced of that thickness, and the firm prefers to pay for the molder's time necessary for venting the mold rather than to increase the thickness of the metal. Molds can be made much quicker without venting, and hence the inclination, especially in piece work, to do away with the vent wire, but no man calling himself a molder should lose a mold the second time from lack of venting.

Mr. Karow's second example of overcoming shrinkage is somewhat interesting. I have used nails with success in the cope to stop shrinkage, but never had any difficulty with the castings coming concave on the side due to shrinkage. This article brings to my mind an example of shrinkage that came under my observation, and the method of overcoming it may be of interest to some. At the time I was a new man in the shop, when a piece of work was brought in to be made. It was the pattern for the half of a chill for molding the hub of a wheelbarrow wheel. The chill was made for stagger spokes and provision made for the steel axle to project through the chill at the top and bottom, the hub to be poured down the side of the axle. This is a nice piece to make and must be very clean and free from holes. It had been made several times in the past without difficulty. The job was given to one of the best men in the shop, who made four pieces, but when they were cleaned up and the hole for the axle and runner bored out a small hole showed up in each casting, and every one said it was a blow hole from the green sand core, and as the vents were taken off from the bottom of the mold great care was given to see that the vents were free when the next casting was made, but the result was the same, and the old cry of "blow hole" went up. The pattern was then changed so as to allow the vent to be drawn off from the cope of the mold. Four more were made, but still this hole persisted. The job now became interesting and all the molders examined the casting and compared notes. The hole was a peculiar one and did not show on the top of the casting, but showed as soon as the skin on the inside was tooled off. I could not believe that it was a blow hole, but thought it a shrink hole, and a very small minority of the men held the same opinion. The foreman and the majority continued to say "blow hole." The center of the mold was next made in dry sand, but without success. The job was then assigned to three different men, the best mechanics in the shop, but without success. At this stage, I suggested that the cope, which was 3½ inches higher than the pattern, should be bushed up with a 3 or 4 inch bush, thus making the head 7 inches. The foreman, with a peculiar smile, told me a bush would do no good. I was a new man in the shop, and so not supposed to know any more than the law allows, but I had learned my trade from one of the most practical molders in the country, and had been told to use what brains I had without depending on others. I determined to have my idea tried, and after much persuasion induced the man then making them to try the bushes on two out of the four molds. The result was that the two molds with the high heads were perfect castings, but the other two had the same old hole in the center. This test convinced the molder making them and the balance were made with the high heads without any more trouble. I might add that before this risers and feeders had been tried in the shallow flasks without any success.

It is evident that in this case the shrinkage was not due to the shape or weight of the castings, for they had been made before without difficulty and without bushing up the cope

of the flask. The difficulty lay in the grade of the pig iron we were using at the time. I made a careful study of the fracture, which I clearly remembered, and after several years have received a dose of the same grade of iron. I had occasion to make the same casting about three months ago and gave the job to the man whom I had induced to try the heads years ago. He made two without high heads and the holes were there as of old, and I found it necessary to resort to the high heads to obtain the castings. I have no means of analyzing this iron, but the fracture resembles that of the iron used when we had the trouble formerly. In a bar 1 inch by 1 inch by 12 inches, it stands a breaking strain of 2,750 to 2,800 pounds. I had no trouble with shrinkage, having successfully made a 1,300 pound casting from it. The casting was cored out considerably, and this may account for the fact that there was no difficulty. We found it almost impossible, however, to make a 70-pound solid round ball without showing a heavy shrinkage, even after feeding with a rod as long as we could. I finally found that we could obtain better results by using a high head and neither feeder nor riser.

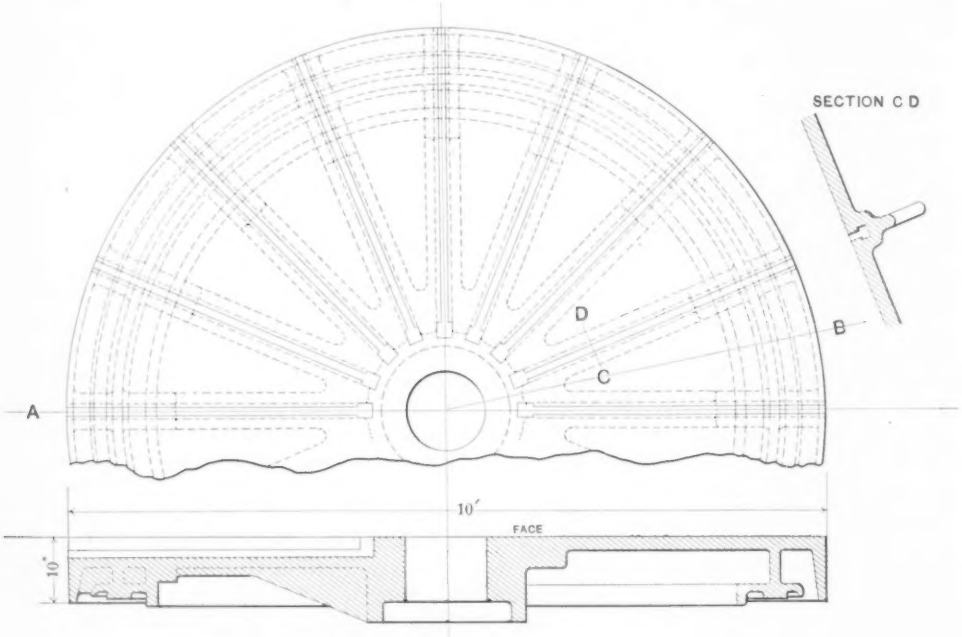
In my experience I have found that up to a certain weight a high head was the best preventative of shrinkage, whether caused by the nature of the iron in the mixture or by the size and shape of the castings. I have also come to the conclusion that small foundries using from one to two cars of pig iron a week do not receive the same even grades of iron that are delivered to the larger shops where the blast furnace man knows a chemist is employed and all the iron will be analyzed.

MOLDING IN CORES.

BY VINCENT COLAJEZZI.

A Face Plate.

Frequently molds composed of dry sand cores can be constructed cheaper and better and will produce better castings than is possible with ordinary green sand molds. The three examples here given serve to illustrate this point very well indeed. A face plate 10 feet in diameter and 10 inches deep is shown in Fig. 1. The chief requirement in this case is that the face must be cast down to insure a clean, sound surface. To accomplish this it has proven very satisfactory, from the molder's standpoint, to construct the mold of dry sand cores. It is, of course, a great saving in pattern expense to follow this method, as the core boxes are much cheaper than the pattern and core boxes would have been for carrying on the work according to the other method.



SECTION A B Fig. 1

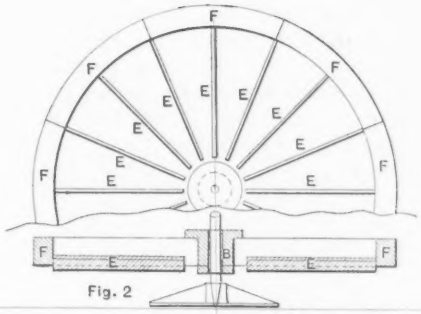


Fig. 2

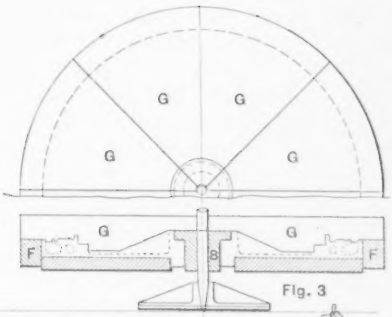


Fig. 3

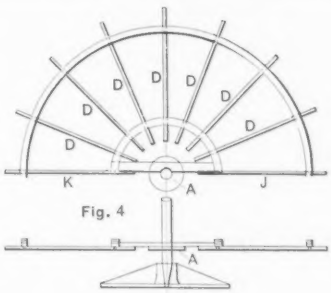
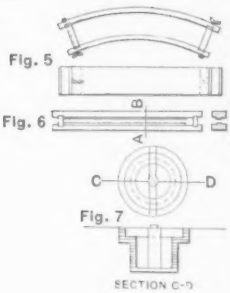


Fig. 4



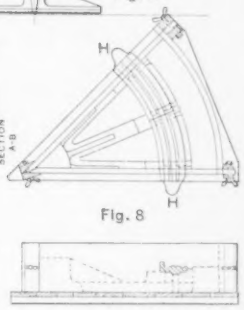
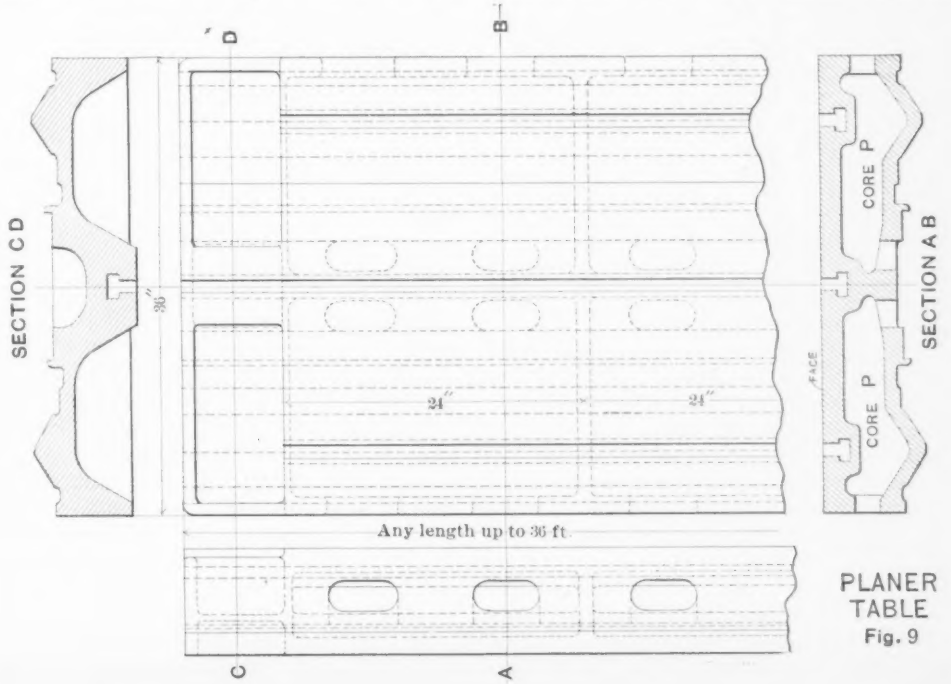


Fig. 8

In constructing the mold, the spindle is first set up and a level bed struck off. Next, the core print pattern A, Fig. 4, is slipped down over the spindle and bedded into the sand level with the bed just struck off. As this core print pattern fits the spindle, it assures the fact that the core B, Figs. 2 and 3, will be located centrally when set in place in the impression left by the core print pattern A.

The core print frame shown in Fig. 4 is next set in place. This frame is composed of two semi-circular rings, attached to which are the T slot core print pieces marked D, J and K. There is also a guide at the center which fits



PLANER TABLE
Fig. 9

against the spindle and assists in locating the frame. The core print patterns are bedded in level to the surface of the bed, taking care to see that the frame is in contact with the spindle during the entire operation. The frame is then carefully drawn from the sand and revolved about the spindle ½ of a turn and bedded in on the opposite side in such a position that the core print J will drop into the impression left by the core print K, and the core print K will fit in the impression left by the core print J. After withdrawing the core print frame and core print pattern A from the sand for the last time, the lower half of the mold will be completed by setting the central core B, Fig. 2, and the T slot cores E, Fig. 2. The wall cores F, Fig. 2, are next set against the T slot cores E, forming the outside circular wall of the mold.

The covering cores G, Fig. 3, which contain the track, ribs, T slot reinforcements, etc., are next set upon the cores F for a bearing on the outside and upon the center core B for a bearing on the inside, or center.

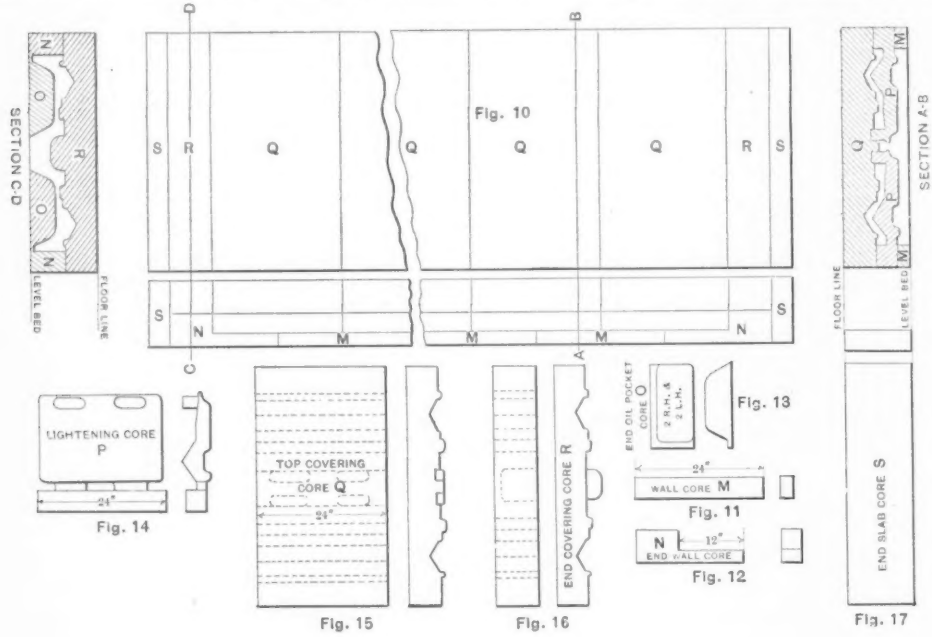
It will be noticed that the cores B and G, Fig. 3, are provided with clearance for the spindle to revolve, thus allowing the use of a gauge stick clamped on the spindle and revolved around to make doubly sure that all of the covering cores G are located centrally.

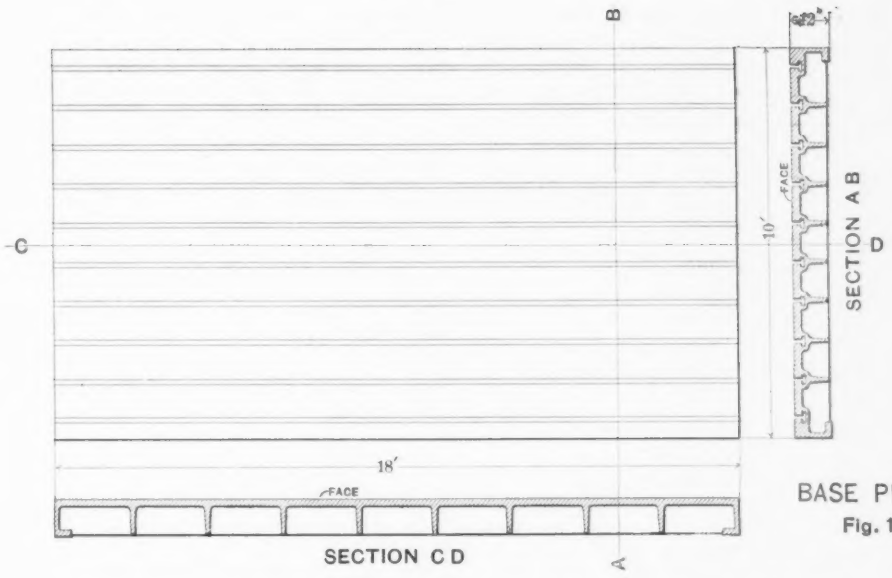
The pattern work necessary consists of the core print frame shown in Fig. 4, the wall core box, Fig. 5, the T slot core box Fig. 6, the center core box Fig. 7, and the covering core box Fig. 8. All of these are comparatively simple, with the exception of the covering core box shown in Fig. 8, which is complicated by the fact that the track piece H must be made to draw out through the sides of the box before the core can be removed from the box.

A Planer Table.

Another example of a casting which can be produced to advantage in a mold composed largely of cores is the planer table shown in Fig. 9. In this case the requirements are that the face must be cast down to insure a sound, clean surface and also that castings of any length may be required, up to 36 feet long, advancing by increments of 2 feet each. It is evident that it would be a great inconvenience to take care of all the different lengths of tables that might be required if a full pattern were made for each. It would also be quite a difficult task to hold the cores shown at P up in the cope of a green sand mold. It has therefore proven satisfactory to make the mold entirely in dry sand cores. It may also be stated that the T slots are planed out of the solid, thereby doing away with the necessity of any cores for them.

In constructing the mold, a level bed is first struck off and the wall cores M and N, Figs.



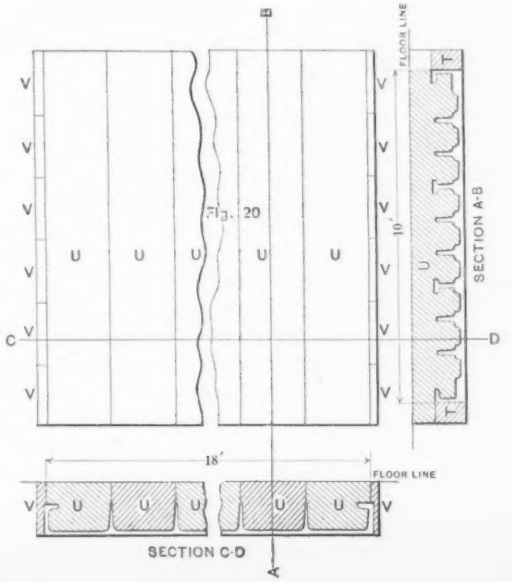


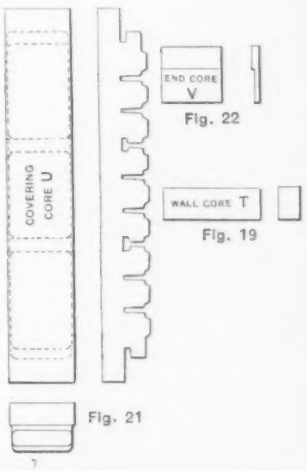
BASE PLATE
Fig. 18

10, 11 and 12, are laid along at the correct distance apart. It will be noticed that these wall cores are all 24 inches long and that the covering cores are 24 inches wide. Therefore, since the castings vary in length by 24 inches, the length of the bed required will determine the number of cores to be made and set.

End oil pocket cores are shown at O, Fig. 13. Four of these will be required, two right hand and two left hand, and one of them will have to be set in each corner as shown in Fig. 10. The tightening cores T, Fig. 13, are then bolted up into the covering cores Q, Fig. 15, and both are then lowered as one core into position with the bearing on the wall cores, as shown in Fig. 10. The covering cores R, Fig. 16, are next set upon the highest part of the wall core N, as shown in Fig. 10. The mold is then completed by closing up each end with the end slab core S, Fig. 17. It will, of course, be necessary to back up the cores with green sand, make the necessary provision for gates and risers and for weighting the mold.

In this case I have shown the cores, rather





than the core boxes, as the construction of the latter is simple and showing the cores completely illustrates the method of doing the work. The pattern work will consist in making the seven core boxes required.

A Base Plate.

A large base plate 18 feet long, 10 feet wide and 12 inches deep is shown in Fig. 18. This also makes a good example of core molding. The requirements of this are that the face must be cast down to insure a clean surface. The T slots are also planed out of the solid so that no cores will be required for these. On account of the fact that the face must be cast down, it will readily be seen that it would be an exceedingly difficult job to lift all of the sand projecting into the deep pockets with the cope if a green sand mold were to be made and also that it would be equally difficult to hang dry sand cores in the cope. Consequently, this job is made in dry sand cores, thereby doing away with a large proportion of the expense for pattern work, and also of the necessity of handling the large cope.

In making the mold, a level bed is stuck off and the wall cores T shown in Fig. 19 are laid along each side the required distance apart, which in this case is 10 feet, as shown in Fig. 20. The covering cores U, Fig. 21, are next laid across from wall core to wall core projecting a distance of 10 feet, as shown in Fig. 20. It will be noticed that the width of the covering core U is from the center of one rib to the center of the next. Therefore each core contains one-half of the thickness of the rib. The two end cores also carry flanges as shown in the illustration, whereas the rest of the cores are plain. After setting the covering cores, the mold will be completed by closing up each end with the special end cores V, Fig. 22. Since the covering cores U each contain only one-half of the thickness of the rib, it will be necessary to form one-half of the thickness of the end ribs in the end cores V as shown in Fig. 20. The pattern work for this job consists in the making of three core boxes, one for the covering core U. one for the wall core T and one for the end core V. It will also be noticed that a base plate of any desired length varying by increments corresponding to the distance between the ribs could be made by adding more cores. Of course it would be necessary to use chaplets to support the bridge cores U and also to back up the mold with green sand, make the necessary provision for gates and risers, and use weights for holding the mold during the pouring.

COKE.

BY JOHN M'CUNE.

Coke is a substance with which all foundrymen are thoroughly familiar, but you cannot make as broad a statement about coke as the Irishman made about whiskey when he said that all whiskey was good whiskey, for all coke is certainly not good coke. Some statements that have appeared in *The Foundry* during the last few months have set the writer cogitating about the subject and the result has been that he has decided to spill over on the subject, say what he thinks about it, and give other people a chance to express their opinions.

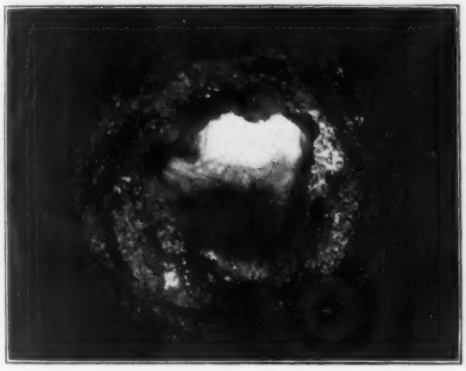
We know that the reason we put coke in the cupola is that we may use the carbon contained therein to melt the iron. So long as the melting progresses properly, the coke is strong enough to carry its burden, and the cupola runs properly, the only thing we are interested in is the carbon and its behavior, but there are two or three other things that are pretty liable to push themselves in for our consideration. Those who have been fortunate enough to have had their entire cupola experience in the civilized East, have probably never encountered any other difficulties than those which arise from the ash and its impurities, including sulphur and phosphorus, and so we may deal with this coke first. As the standard Connellsville coke usually contains well above 10 percent ash, it has been stated that 10 percent ash was an absolute necessity in a coke, to enable it to carry the burden.

Theoretically, this looks to the writer like throwing a lot of slag into the cupola to keep up the iron and as a consequence, he has been making some inquiries and doing some writing, asking the other fellow about his practice and so on, until he has come to the following conclusions: First, the foundryman is "sot in his ways" in regard to coke, very much as he was about iron before mixing by analysis came in, and he is liable to use the brand of coke which he has always been used to. Second, the first cost is liable to play an unusually large part in the selection of foundry coke.

The introduction of by-product ovens throughout the country has introduced a large amount of by-product coke and where this is strong enough it has formed a very useful foundry coke, though it has upset all of our theories concerning fracture and looks of a good foundry coke.

In many cases the by-product coke runs as

high in ash, or higher, than the standard Connellsville coke. The West Virginia cokes can furnish anything a man wants in the way of good practice or trouble. There are some soft mushy cokes made there which will not carry any burden at all, and there are other cokes made which contain in the neighborhood of 7 to 7½ percent ash, which will carry the burden as well as any of the ashy Connellsville coke; in fact, sometimes such brands as the Powellton coke have been known to run only about one-half of their guaranteed amount of ash and still carry the burden perfectly. This seems to explode the theory that the ash of the Connellsville coke was what made it carry the burden so well and to show us that this was only one of the nice talking points of the man who had the high ash coke to sell. The burden carrying power of a coke is undoubtedly to be found in the cell structure more than in the ash contained. If the walls of the cells are fairly thick and hard, the coke will carry its burden well, no matter what the percentage of ash, but the percentage of ash has certainly got to be accounted for in cupola practice, on account of its lining destroying propensities, and on account of the fact that flux is required for carrying off the extra ash.



INTERIOR OF CUPOLA.

In selecting a foundry coke the writer would give the following advice. First, make sure that the coke has an established record as a good foundry coke, unless you are willing to experiment. Second, under any circumstances make sure that the producers can guarantee a continuous supply of uniform quality. Third, in comparing prices, compare quality and fuel value also. If one coke contains 14 percent ash and the other is guaranteed not to contain above 7½ percent, it is evident that you are getting 130 pounds more carbon in each ton to be used in melting iron in the 7½ percent coke than you are in the other. Then also, you are avoiding about 200 pounds of slag to each ton of coke used, together with the cost of the corresponding amount of flux necessary. You may say that you have short heats and never use flux, but if you will investigate your cupola you will probably find that you are using pig iron for flux, as the ash is bound to have flux to form slag and if it cannot get limestone or fluor spar it will take iron.

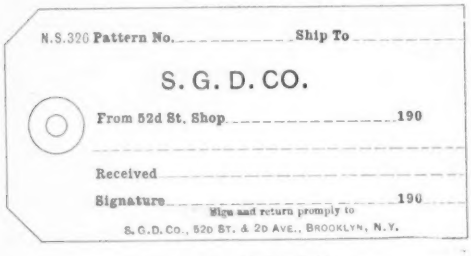
From the above conclusions it is evident that under some circumstances it may be cheaper to ship a more expensive coke from some distance than to use a cheap local supply, especially when we take flux, lining and all into consideration.

A word or two concerning the experience of those who have had the pleasure or pain of trying to run a foundry in a new country may be of interest. At one time a certain Western coal mine or its owners got a notion that their coal was a good coking coal. They built some beehive ovens and produced some of the prettiest coke that any one ever saw. It was hard, had a nice luster and seemed to be a perfect coke. Fortunately for the foundrymen, this coke was tried first in a lead smelting furnace and promptly froze the furnace up. Every one had noticed that there were some little white specks in the coke but had paid no attention to them. Investigation, however, showed that the coke contained over 20 percent ash, and that of this a large portion was calcium sulphate, or gypsum, which is a very troublesome thing to try to slag out of a cupola or any other type of furnace. Some of this coke was tried in the cupola, but without success.

At another time through the extreme economy of the purchasing agent the writer found himself forced to try and take off a heat with gas house coke from the gas works of one of the Western cities, and it is certain that in this case the "heat went bung," for the coke was not strong enough to carry the burden in the first place, and in the second place it was simply loaded with sulphur and ash. It was impossible to get a sufficient amount of air into the furnace to melt it fast enough to free things up, and the accompanying half tone made from a photograph produced by hanging the camera at the charging door and looking straight down through the cupola will give some idea of the mass of slag about the tuyeres after a hole had been punched through the center and the upper portion of the charge gotten out. What iron was secured from the heat was so loaded with sulphur that the castings were worthless.

SYSTEM FOR STORING AND CARING FOR PATTERNS.

The care of patterns is at best a perplexing problem, bad enough in an establishment where but one line of work is carried on, but increasingly difficult as the variety of work increases. The system here described is one which has been developed as the result of several years' experience, is now in use by a large corporation operating properties of


N.S.320 Pattern No. _____ Ship To _____

S. G. D. CO.

From 52d St. Shop _____ 190

Received _____

Signature _____ 190

Sign and return promply to

S. G. D. Co., 52d St. & 2d Ave., Brooklyn, N.Y.

FIG. 1. TAG FOR PATTERN.

several kinds, and is especially adapted to a very diversified line of patterns.

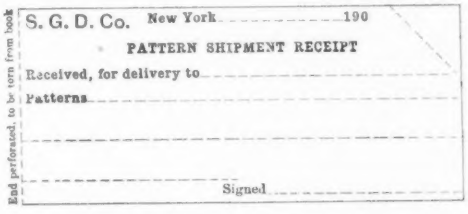
The subject may be divided into five heads: Making, handling and shipping, accounting, indexing, and storage. The first, making, does not fall within the scope of this article.

Patterns, as completed, are numbered consecutively and turned over in the drafting department, which has general charge of patterns. After examination to make sure that the pattern agrees with the drawings, has number stamped on every removable piece and has raised figures to identify the castings, the pattern is entered in the pattern book. This, the only bound book used, is a common cloth-bound book of 200 pages. In the left margin, four lines apart, the pattern numbers are stamped consecutively, and in the space opposite, the title and a rough sketch of the pattern. These sketches are merely for identification of the pattern, reference being made for details to the original print or drawings on file. Each book contains only 2,400 patterns, but the use of several light books is preferable to one ponderous volume, because the light book can be carried to the pattern, if necessary, instead of bringing the pattern to the book, while if cards are used, one will, in the best regulated offices, occasionally be lost when taken out for reference. The numbering of patterns consecutively, rather than by any other system, simplifies the entire routine.

When a pattern is to be shipped, a tag, Fig. 1, is attached to it. These tags are Dennison's "G" quality and cost, in lots of 2,000, $1 per thousand, printed and with string attached. The date and name of foundry are inserted by rubber stamps, and an abbreviated title is written in. The title is for convenience only, and might be omitted. A receipt, Fig. 2, has the date and name of foundry inserted at the same time as the tag, and is signed by the messenger or drayman who delivers the patterns. When the tags are returned, signed, by the foundry, the corner of the corresponding receipt is clipped, unclipped corners thus indicating delinquency either in delivery of patterns or in return of tags. The foundry is notified, after a few days, of such delinquency.

The tags, as received, are sorted according to foundries, and filed vertically in numerical order, in shallow drawers, one drawer for each foundry. The tags in any drawer represent all the patterns at that foundry, except those for which tags are in transit. Upon the return of a pattern, receipt is given on a form similar to Fig. 2, the corners of the carbon copies of these receipts being clipped as the corresponding tags are removed from the drawers. The date of return is stamped across the face of the tag, and it is fitted in another drawer, which contains a history of the travels of each pattern, one tag for each trip it has made to a foundry. This completes the accounting, every operation being duly checked, yet without unnecessary clerical work.

Next in order is the indexing. The ideal


End perforated, to be torn from book

S. G. D. Co. New York _____ 190

PATTERN SHIPMENT RECEIPT

Received, for delivery to _____

Patterns _____

Signed _____

FIG. 2. RECEIPT FOR PATTERN.

indexing system provides means for finding readily the number of any pattern when its name or its use is known, and for ascertaining whether there is in stock a pattern which can be used for a given purpose, whether originally made for that purpose or not. This end has been attained in a very satisfactory degree by a modification of the decimal system of classification, familiar by its almost universal use in libraries. The principal classes of patterns, corresponding to the various departments of work, are given numbers 10, 20, 30,

etc., up to 90; divisions of these classes are numbered in the units place, and subdivisions in the tenths place; this can be carried out to hundredths and thousandths, but that will seldom be necessary. Thus, suppose one of the classes, 30, is "Shop Machinery and Tools;" it could be divided into 31, Machine Tools; 32, Wood-Working Machinery; 33, Hand Tools; 34, Dies; 39, Other Shop Machinery and Tools. Division 34 could be divided into 34.1, Bulldozer Dies; 34.2, Steam Hammer Dies; 34.3, Press Dies; 34.9, Other Dies. If division 34.1 happened to be specially large, it could be subdivided into 34.11, Bulldozer Dies for Structural Shapes; 34.12, for Pipe Hangers; 34.19, Other Bulldozer Dies. The ninth division is always reserved for "other" patterns, as in the examples above. This decimal classification should be carefully prepared for the particular business to which it is to be applied; but once the classes are laid out, it will be found easy to use and very flexible.

The class number of each pattern is written in the margin of the pattern book, below the pattern number, in smaller figures, and is checked when entry is made on the index sheets. Some patterns may be entered under two or more heads, and in case of any uncertainty as to which of two classes a pattern belongs in, it should be entered in both. The index sheets are ruled bond paper, 8⅝ x 12 inches, with holes punched in the left margin for fasteners. At the head of the sheet is written the number and name of division, thus: "31.3, Planers," and all patterns in this division are entered, number and title, in suitable ruled columns. India ink is used, so that blueprint copies of the whole index, or of given classes, may be made for the foremen, order clerks, or others. These sheets are bound, in numerical order, in a Shipman Common Sense Binder No. 128½, with an outline of the classification on the first pages. The sheets cost 45 cents per 100, ruled and punched to order. To find a pattern—a commutator nut, for example—the outline is consulted and the class "40, Motors" is selected, next the division "43, Armatures" and subdivision "43.6, Commutators." Turning to the sheet headed 43.6 a list of all patterns for commutators is found. A novel feature is the "90, General Utility" class. In this class are listed patterns which, while already indexed under the divisions for which they were originally made, may be useful for other purposes. Under "92, Gears and Sprockets" will be listed lathe gears from 31.2, brush-holder sprockets from 43.4, hoisting-engine gears from 63.2, etc. The draftsman, in designing new apparatus, or the shop foreman with a breakdown on his hands, has thus for reference a complete list of all gear and sprocket patterns in stock. Other divisions of the 90 class are pulleys, rods, disk shapers, tube shapers, bearings.

There remains only the storage of the patterns. The arrangement adopted in this case is adapted to a large range of sizes. Tiers of shelves, five high, preferably of fireproof material, are provided, divided by transverse partitions into sections five feet long, each section numbered 3400, 3500, etc. An open room, with hooks on walls and ceiling, is also provided, this being divided by painted stripes on floor, walls and ceiling into sections numbered 1, 2, 3, etc. The patterns from 3500 to 3599 are stored, as far as there is room, on the shelves of section 3500; the overflow of large patterns is stored in the open room, much space being saved by storing similar patterns such as pipe flanges or floor plates together regardless of their numbers. In each shelf section is a covered box for very small patterns, and a heavy card on which are written the numbers of all patterns removed to the open room, and opposite each the number of the section where it may be found. A person wishing to find pattern 5369 can get a general idea of its shape and appearance from the sketch in the pattern book, and has then only to look through the shelves of the 5300 section.

In conclusion it may be said that originality is claimed for few of the features of this system. It has grown, step by step, through the necessity for keeping accurate account of patterns, avoiding duplication, economizing space, and at the same time avoiding elaborate clerical work. It is believed that this system gives a maximum of accuracy and convenience, with a minimum of labor.—By R. S. Cremin, in the *American Machinist*.

YARD CRANES.

BY FRANK B. KLEINHANS.

A yard for storing castings is a necessity in nearly all manufacturing establishments. Many of the crowded conditions of the erecting shop would be removed by having a convenient yard nearby. This is true in both the manufacture of light and heavy machinery.

In the manufacture of light machines, a

large stock of castings must be carried. Competition is keen and prompt deliveries important. A large variety of castings must therefore be carried in stock, in order that there may be no delay when an order is received for a machine.

In the manufacture of heavy machinery, many large castings are required for each machine and in order to facilitate work in the foundry, it is frequently a great advantage to run castings through before the machine shop is ready for them. Unless a yard is at hand, these castings must be piled up in the foundry or machine shop and thus much useful space is occupied. Any superintendent who has had to spend three hours with one or two of the traveling cranes, in order to dig out some casting at the bottom of the heap, will agree that a yard would be a useful addition to the plant.

A yard should be arranged if possible, to admit of the least amount of handling when storing castings or in removing them. Of course some overhead traveling cranes furnish the most convenient method in order that all parts of the yard can be served to good advantage.

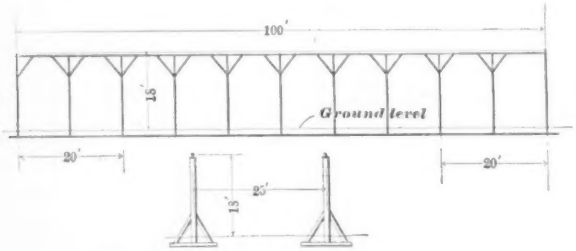


FIG. 1.—MAIN DIMENSIONS OF YARD CRANE.

To meet the general requirements for the manufacture of medium weight machinery, a yard crane of 6,000 lbs. capacity would be heavy enough. This crane should serve a runway of from 50 to 150 feet in length and in width from 12 to 30 feet. The cheapest support for a crane of this capacity would be a wooden structure. The crane itself should be provided with power traverse of the bridge. The raising and the lowering of the castings could be done with a hand chain block and the movement of the trolley would also be by hand.

The general arrangement of a runway for a yard is shown in Fig. 1. This is designed for a runway of 100 ft. in length and for a span of 25 ft. The height from the ground level to the rails would be 18 ft. The framing can be made of 8 x 8 in. yellow pine. A detail of this framing is shown in Fig. 2. The top beams G would be spaced 20 ft. and supported on caps C as shown. The braces B would also be made of 8 x 9 in. yellow pine and would be notched both in the column and beams. The

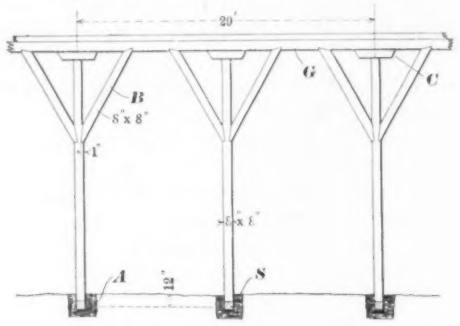


FIG. 2.—LONGITUDINAL DIMENSIONS OF YARD CRANE.

column would extend underneath the ground level of the yard and be supported on sills S. After the runway is framed together, the whole thing is leveled with stone or cinder ballast at A, this being pounded in under the sill, in much the same way as a newly laid railway track is straightened and leveled.

A cross sectional view of this runway is shown in Fig. 3. The braces B are 8 x 8 in. and are notched one inch deep as shown. If the runway can be attached to a building on one or both sides the lower braces need not be as secure as shown in this illustration.

The rails would be put in place and the joints bolted together with fish plates. After the runway has been straightened and leveled the rails would be spiked down after the usual manner so as to give 25 ft. center to center of rail.

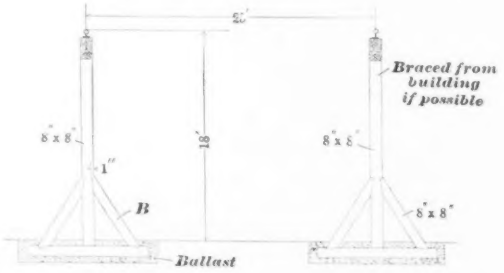


FIG. 3.—TRANSVERSE DIMENSIONS OF YARD CRANE.

The arrangement of a 6,000 lb. crane is rep-

resented in Fig. 4. The hand chain block B would be hooked in the trolley link as shown. The traverse of the trolley, back and forth, would be accomplished by the use of the hand chain C. The bridge would be traversed with the motor M. The racks R and R would be bolted to the rail and would extend the full length of the runway.

The following is an estimate of the cost of a hundred foot runway crane and everything complete as described:

8 x 8 in. yellow pine @ $28 per thousand.	$ 118
Crane complete but without motor.....	475
5 h. p. motor	125
Rail spikes, bolts	56
Racks, bolts, etc.	76
6,000 hand chain block	78
Erection of runway, setting of crane, etc.	90
	$1018

This amount of money could be invested to good advantage by many manufacturing concerns which are laboring under disadvantages in their foundry and machine shop.

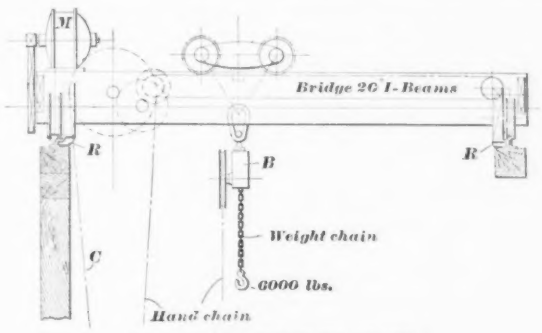


FIG. 4.—THE TRAVELING CRANE.

THE PATTERNMAKER FROM A MOLDER'S POINT OF VIEW.*

BY WM. S. MCQUILLAM.

I wish to offer my apology in advance for inflicting upon you a paper which might be construed as casting reflections on members of a worthy craft. And I tremble some when I remember that one of them has intimated that he would like to write a paper on "Molders from a Patternmaker's Point of View." And as if that were not enough, one of my employers has signified his intention of writing "Castings from a Customer's Point of View." However, as he says nothing short of a volume will do the case justice, we may have time to escape the consequences of the wrath to come, if we can only succeed in bringing our business up to the standard aimed at by the Foundry Foremen's Association before that book is finished.

The only excuse I make is to help along discussions that will draw out from the great fund of foundry knowledge present a few points that might put us in a position to atone to those customers by giving them better castings for less money.

Among the many important considerations of foundry practice the one of patterns is not the least. The most intelligent thought must be given it from the foundry point of view, as too often this very important equipment is left with people who have very little conception of the requirements of the molder, and the conditions and elements with which he has to deal. Patterns are often given us upon which time and money have been wasted and which might be saved if the molding points had been directed by some one whose experience has made him competent to see the obstacles that may arise, not only in the molding but in the structure and quality of the castings to be made. Patterns might well be said to be a large part of the foundation on which the foundry stands, and we might safely say that the standard of a business may be pretty safely gauged and the measure of success or failure to make the foundry pay can be traced to the condition and grade of this very important part of equipment, especially in these times when the greatest amount of work for the least money is required by the hustling competition of the business. How often we see loss of time due to the molder trying to get around some points in his work that would seem intended not alone to try his skill as a molder but to give him an opportunity of solving a puzzle. Many points are overlooked in patterns through ignorance and often through a desire to save cost. They are too often rushed through and the foundry has to make up for their deficiency —sometimes for years to follow. The money thus spent for time and castings that might have been saved would many times over have paid for good patterns. Take the matter of proper draft alone, which is so often neglected —sometimes on patterns otherwise well made and finished. Much valuable time is consumed in making poor castings through slicking and patching, trying to make a mold as it should have been if the pattern had left it

*Paper read at the seventh monthly meeting of the New York Foundry Foremen's Association.

without tearing it to pieces. It is a fact easily recognized that the mold produced by a free and smooth pattern, upon which there is little or no work for the molder's tools, will almost always produce the best and smoothest castings. Again we find patterns that show that much time and money have been spent upon them and apparently nothing spared to make them first-class, still the ideas of a designer or maker as to how they should be molded to the best advantage are very much at variance with the knowledge and experience of the foundryman, who will have to study out a way to begin work on the job. By modification of the lines or changes in construction, which would be of little importance in the article to be produced, a great deal of time and worry might be saved in the foundry. We are sometimes told that every foundryman will want patterns changed to conform to his own notions and ideas and we must admit that this is very often the case. But in looking over the patterns of this kind carefully, in a majority of cases we will find it is because of the general cussedness of the original pattern that the foundryman has to work overtime to devise the changes referred to. It is safe to say that there is intelligence enough in most foundries to recognize the merits of a good pattern, and the higher the quality of patterns in general the less question will there be as to the manner of molding them. Patterns that will leave the least for the molder's skill and his tools will invariably produce the best castings at the least cost. Now, while we will admit that there are many indifferent molders in the business, this should be the greater reason for making our patterns as near automatic as possible. That foundry is indeed in a bad way that must depend upon having the highest skill to make all its castings. We can plainly see that it is most always the best equipped shop that turns out the poorest molders, as in such shops the men are not required to exercise the same amount of skill to produce quality and quantity as in shops with poorer patterns and equipment. There are apparently some people engaged in the making of patterns who will give us for their excuse for the many defects that they have followed the lines of the designer or draughtsman and must therefore have produced the article as intended by him, which would be all very well if the pattern were the only end sought. Along this line of argument, if the designer wished to produce, for instance, a piece of furniture in cast iron, why would it not be best to have a cabinet maker make the pattern on account of his ability in that line? It is not hard to imagine what our troubles would be if we were to take our patterns from the furniture store, where we might get them from among many designs and at much less cost. How would it do to follow along the same lines if it happened to be a dog or horse, or some other animal that was wanted. Besides these questions of draft and finish there are many other points which require the careful treatment which experience in handling has taught us to be the best. Seldom can the handling of one job lay down specific methods for the handling of others. We must study and know the constitution of each subject separately before we prescribe for their ills.

Like many others who have probably had troubles with patterns, I feel more competent to talk about complaints than to prescribe remedies. Therefore we will confine this paper to a few defects and what appears to be a remedy for them in the foundry after the patterns have been made.

Take for example a plain flat plate of equal thickness and of ordinary size. If we make this plate a certain thickness—say from one-half inch up—we have little trouble keeping it straight, but if we make a piece below that thickness we are liable to have more or less trouble with the plate warping. This will be greater with the thinner than with the thicker castings, and will be due to the unequal temperature of the metal at the time the mold is filled. In the heavier castings the body of metal will keep at all times a more even temperature than in the lighter ones because it will have more room to flow over the whole surface in a heavier body and will avoid the chilling effects of the sand. While in the thinner castings the metal will flow only to certain points and cool at those points and sometimes will set before other points are covered by the metal. The result will be, the cool places will in a great measure have finished shrinking before other parts have begun and we find the resistance of the cool parts to the shrinkage of the hotter parts will cause the casting to yield to the strain thus produced. As shrinkage must take place it will throw out the surface of the plate, and the larger the area the greater will be the amount of warp. This rule will follow in all kinds of castings where the cooling is unequal, and often we are forced to use a much softer iron to avoid the consequences than we would if consideration had been given to the construction of the pat-

terns and they had been made of a uniform thickness or the different parts had been made with a view to counteracting the unequal cooling of the metal after it had gone into the mold. The reason why the softer iron will not warp and crack as easily as the harder iron is probably due the fact that in the softer iron we have a greater amount of carbon in the form of graphite in particles which are surrounded by a network or lacework of iron. Any strain brought to bear on the casting through shrinkage or otherwise will draw out this lacework into straighter lines and finding little resistance in the soft particles of graphite, will more easily adjust itself to the strain and greatly reduce the tendency to warp or crack. But in the harder iron where there is a less amount, if not an entire absence of these particles of graphite, there would be far less chance for adjustment, as the iron crowds itself and often offers greater resistance to the shrinkage. Along the lines of this theory we might have our patterns made and the castings poured, with a view to equalizing the distribution of metal. The parts that are most liable to run cool we could, whenever possible, make a little heavier, and the parts that are subject to the most flow of iron might be made a little lighter so that as the metal cools it would keep at a more even temperature. The shrinkage would be made equal at all points at the same time. Then again if more attention were paid to the causes and effects the position in which to mold the article could be decided and the pattern made accordingly. In many cases it would tend to a more equal cooling if the lighter parts were made in the lower part of the mold, as the upper part, if lighter or of even thickness, will always cool quicker than the lower parts. Of course there are many cases where the form of the article and its requirements will leave no choice of molding it up or down, but in such cases if judgment is exercised the metal might be run into the mold so that the hottest iron would go to the places where there is the most liability to cool first. A good illustration of this might be a wheel or some other article of this form that has a hub or heavy part in the center that would have a tendency to draw and crack.

If the metals were run in at the lightest parts it would, to reach the center, have to flow over a greater surface and would in consequence have become cooler than when it first entered the mold; while the lighter parts would have the full heat of the metal at the time when the mold was filled.

FANS AND PRESSURE BLOWERS FOR THE FOUNDRY.

In *The Foundry* for January was given the full report of the committee of the Pittsburg Foundrymen's Association, appointed to investigate the use of fan and positive pressure blowers for foundry cupolas. The particular question sought to be determined was the amount of power required for fan and pressure blowers, respectively, but the inquiry also covered other points having to do with the relative efficiency of the two forms of blower. Following the presentation of the committee's report at the December meeting of the Pittsburg Foundrymen's Association, there was a discussion of the important questions involved, and with a view to eliciting a more general expression of opinion further discussion was made the order for the January meeting to be held Monday evening, Jan. 9. In view of the value of the Pittsburg inquiry of foundrymen generally *The Foundry* invited expressions on the subject from the manufacturers of fans and blowers, and has in reply the letters given below:

Difficulty of Providing Identical Conditions.

You ask in yours of Dec. 10 for comment upon the report of fan and pressure blower tests presented at the December meeting of the Pittsburg Foundrymen's Association. Restricting ourselves solely to a discussion of the statements made within the report, we would first point how how emphatically these tests indicate the difficulty of providing identical conditions under which comparative results can be secured. Neither a single test nor a single cupola is sufficient to establish relative efficiencies of blast producing mechanism. The slight change in the size of the pieces of scrap charged produced such a marked difference between the results secured in the first and in the second series of tests, that one may properly question how near alike the conditions were in the two individual tests constituting either series. A single piece of scrap might, in any one of the four individual tests, have been of such excessive size as to introduce abnormal resistance to the passage of the air and gases upward through the charges. It is therefore manifestly true that conclusive results can only be obtained by carrying tests through an extended period and by considering the efficiencies of blowers under varying conditions. It is probable that the scrap used in the second series conformed most nearly to that commonly found in the average foundry, and there-

fore this series is more fairly indicative of average working conditions throughout the country.

It is well said in the report that the actual saving in horsepower is not a large item. It is unfortunate that foundrymen often thoughtlessly consider the annual cost of power to be measured by the number of working days multiplied by the actual horsepower consumed by the blower; but as a blower operates only two or three hours per day, the total expense would be only one-quarter to one-third of the amount figured in this faulty manner.

Slight exception should be taken to article 3 of the addenda, where it is stated that "as the openings decrease in the cupola, due to the closing of the tuyeres, etc., the positive blower will force the same amount of air through this opening as it previously forced through the larger opening." This is true up to the limit of capacity of the blower, but under any conditions the relative power consumed is inversely proportional to the square of the area when the volume is maintained constant. In other words, if the area is reduced one-half, the velocity will have to be doubled to pass the same volume of air, and the total power required will be quadrupled. No other comment is necessary to show the absolute necessity of the freest possible areas for passage of air through tuyeres and charges. In fact, cupola blast practice consists principally in overcoming resistances, and it is undoubtedly true that in many cases the money expended in reducing scrap to smaller dimensions would be offset by the decreased cost of forcing blast through the more open charges thus provided.

The most interesting of all information to have secured in connection with these tests would have been the actual volume of air delivered to the cupola by both types of machine. This, however, is a practical impossibility without somewhat elaborate experimental equipment, and the report very properly states that the amount of horsepower consumed by the fan and blower are the only guides to the amount of air supplied.

The report as published lacks much desirable data regarding cupola, blower, fan and general arrangements.

B. F. STURTEVANT CO.,
Hyde Park, Mass. By W. B. Snow.

Elasticity of the Centrifugal Fan.

The writer has been very much interested in Mr. H. E. Field's report on the comparative fan blower tests made at the instance of the Pittsburg Foundrymen's Association. The conclusion drawn can hardly be criticised by either party to this controversy, and the Pittsburg association deserves much credit for the thorough way in which they have carried out this investigation.

It was to be expected that smaller fan blower would afford better results with a cupola 54-in. inside lining, which would hardly require 5,000 cu. ft. of free air per minute when melting its rated capacity, as was the case during this test. It would appear that the fan manufacturers erred in their desire to make sure of having the capacity ample. The No. 8 Sturtevant fan, which was the permanent provision for blast for the cupola, is the size which would naturally be selected. A few points have occurred to the writer which could be added to the conclusions embodied in the report and give a still more favorable aspect to the case of the centrifugal fan.

1. Both of the experimental outfits were new, but in the course of years there would be a decrease in efficiency of the positive blower on account of wear in the contact surfaces, unless kept in adjustment.

2. The centrifugal fan is more elastic in its requirements, and when used from day to day on charges considerably lighter than the capacity of the cupola, it would handle them more economically than the positive blower, the discharge from which would be choked down, although the horsepower required would be greater.

3. If the cupola tender has a blast gate or cut-off in the pipe near at hand, the power expenditure of a centrifugal fan can be quite materially reduced by regulating the blast pressure according to the condition of the cupola. This is impossible in the case of a positive blower.

To illustrate the extreme elasticity of the centrifugal fan, if we take the horsepower required when running at normal capacity as 100 percent, exact tests show that when running at only half the full capacity, the horsepower required will be 60 to 65 percent and with blast gates closed off entirely, 28 to 30 percent. The fact that with piping on the outlet disconnected the fan will take almost exactly double the normal horsepower, shows the importance of having properly designed piping and a fan neither too small nor too large for the cupola.

It is interesting to note that a second test with the positive blower running at a lower speed than recommended by the makers gave a rate of melting nearly as high and with less

power. Possibly a similar change in the speed of the centrifugal fan would have shown the same result. The experiment would be interesting. According to Mr. W. H. Carrier, of the Buffalo Forge Co.'s experimental department, an increase in pressure of 50 percent from 10 oz. to 15 oz. pressure gave an increased melting capacity of 25 percent from 6 to 7½, the test being made on a 44-in. cupola. At the same time, the horsepower increased from 16 to 29, or nearly 100 percent. As a result of a series of tests, of which this was one, Mr. Carrier derived a formula for the horsepower required by a centrifugal fan, as follows:

H. P. equals $D^2 \times$ square root of $P^3 \div 3{,}800$.
D equals diameter of cupola inside lining.
P equals pressure at cupola in oz. per sq. in.

Based also on these tests and on this formula, a table was prepared, according to which a cupola 55-in. inside lining, supplied with blast at 12 oz. pressure by a centrifugal fan, should melt 20,960 lb. per hr. with the ordinary melting ratio, and should require not over 32.7 h. p. for the blast.

The above data are taken from a paper read before the last convention of the National Foundrymen's Association, held in Indianapolis, and it is interesting to see how closely the Pittsburg Foundrymen's Association tests agree.

BUFFALO FORGE CO.,
Buffalo, N. Y. By C. A. Booth.

More Air Furnished by Pressure Blower.

I wish to thank you for the opportunity and make use of it by calling attention to a few points in connection with the test, without disparaging it in any way. I am in thorough accord with the efforts made and appreciate the facilities furnished and courtesy extended by the parties conducting the test.

An examination of the test records shows that the amount of air furnished by the blower was largely in excess of that furnished by the fan, or the pressures would have been more nearly alike, as the average free opening would be approximately the same. This means a waste of effort on the part of the motor to supply the excess pressure. It would be cheaper to set a relief valve at 16 or 18 ounces and allow the excess air to escape, rather than burn out the lining or chill the iron.

The test shows that a rotary blower may be used to force a heat in short time, if necessary, but it does not seem to me that the pressures used were those of normal foundry practice. Of course, a variable speed motor would be more economical than allowing the excess air to escape, but even a relief valve would have saved, roughly, 20 percent of the power on the blower test. It is fair to assume that equal pressures at the cupola are due to equal amounts of air passing through it, and a comparison of power used speaks rather plainly in favor of the blower. The positive blower is absolutely flexible in regard to speed up to its limit and its efficiency changes but slightly for the variations of speed needed in melting. The data of tests show this clearly.

Where a variable speed motor cannot be obtained, a relief valve would save power. Where the source of power is approximately as efficient as a simple engine, a direct connected engine and blower is the most flexible and efficient, for the engine speed may be regulated to suit the pressure, by either a hand cut-off adjustment or throttling.

A foundry using a fan is going to get every possible benefit inherent in the fan outfit; so with the positive blower, every point favorable to securing good results should be utilized.

I do not want to be understood as criticising the tests made, for all the conditions were fair and just; but what I do want to point out is that it is my belief that the good points of the rotary blower were not utilized to their best advantage.

P. H. & F. M. ROOTS CO.,
By Geo. C. Hicks, Jr., Engineer.
Connersville, Ind.

The Cleveland Pneumatic Tool Co., of Cleveland, O., has issued two very neat calendars, which are reproductions from noted paintings. Both show very pretty girls. They are sending these out to their customers, and have also made arrangements to supply any one who desires them with duplicate copies of the calendars without the advertising at a reasonable cost.

The S. Obermayer Co., of Cincinnati, Chicago and Pittsburg, have gotten out another warm time calendar, evidently intended for desk use, as it is only 3½ by 8 inches. It consists of a picture of a barrel of their Ceylon plumbago, upon which a dancing girl is posing for the benefit of all beholders. Opposite her are the words "The Molder's Pride," and opposite the barrel,—"Ours too." There is a small calendar at the lower end of the picture.

METALS IN FOUNDRY PRACTICE.

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Steel, Brass and Bronze.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

C. Vickers, Brass Castings.

We have also made arrangements with several others to act as special contributors upon Brass, Bronze and other subjects. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

Loss on Agricultural Castings.

It is not stated whether molders' discount castings is meant or castings too poor to be counted, or the difference in weight between the iron charged into the cupola and the good castings.

If the iron furnished the men is uniformly good, 1 percent would be a fair allowance for all bad castings. The difference between all iron charged and all iron taken out of a cupola should be from 4 to 5 percent.

Core Arbors for Soil Pipe.

This question comes from Germany. The answer is: The small slots in the cast arbor are not more than 3-16 in. wide and about 2 in. long.

A plain, dry sand core is first made for the inside of the arbor and small cores for the slots are fixed at desired points on this core with flour paste.

Melting Iron in an Air Furnace.

Question. I would like to know the advantage of melting iron in an air furnace instead of a cupola for cylinders, etc.

I would also like to be able to prevent castings being porous so that they will be watertight.

Answer. A number of large foundries are melting in cupolas and air furnaces at the same time and mix the melted iron to produce the quality of castings that they require. This practice will be more and more common and will give large founders who can afford to do this a very great advantage over smaller ones. The advantage of air furnace castings is that a larger quantity of iron of uniform quality can be prepared at one time than in a cupola. Castings from it are about one-third stronger and are more uniform in structure and are more free from sponginess and blowholes, but it takes a great deal more fuel to melt iron in an air furnace than in a cupola. The ideal iron seems to be a mixture of the two just before pouring.

Air Cooled Automobile Cylinders.

Question. I have lost a good many cylinders from blowholes under the cores. When I skindried the mold they came out good, but as we make about forty a day I would like to bake the molds in an oven and would like a good, dry sand mixture.

An iron mixture that made a casting with Si. 1.81, S. 0.052, P. 0.504 and Mn. 0.48 was good, but our present mixture with Si. 2.25, S. 0.038, P. 0.60, Mn. 1.50 is much better.

Answer. On page 185 of *The Foundry* for December is a formula for dry sand molds. You can make the cylinders in green sand if you use the proper sand for molds and cores and vent both sufficiently.

Automobile work is doing more to make good molders and coremakers than anything that has ever happened before and its influence will be felt in all kinds of machinery castings. Your analysis is incorrect in both cases. You could not make a casting with sulphur as low as .052 or .038 and iron with either analysis would not be fluid enough for that work.

With silicon at about 2 percent you should have phosphorus about 1.00 percent and for an easily machined casting the manganese should be under 1 percent.

Evidently you have your mind on chemical analysis without having correct data. In such case you had better use irons that will make the phosphorus and silicon about as suggested and keep a uniform shrinkage of a ½-in. test bar at about .150 per foot.

Cracking of Bath Tubs.

Question. A good many tubs crack after or during the casting or during the annealing process. I think that the difficulty is with varying thickness of the iron pattern.

Answer. A great deal of skill is required in making a good bath tub and it would be impossible to go into a full discussion of the subject in these pages. The thickness of a pattern should be such that the casting shall be free from the strains that cause your tubs to crack. A change in method of gating would no doubt remedy the trouble.

Foaming of Slag.

Question. Our cupola is 72 inches in diameter and we melt about 35 tons at a heat and charge 25 pounds of fluor spar and 20 pounds of limestone to each charge of 300 pounds of iron. The first three charges have no flux.

The slag is so light that the wind holds it up above the tuyeres. If the blast is shut off the slag runs into the tuyeres and wind box. We are obliged to keep the wind on until we drop the bottom.

Answer. The slag hole should be kept open so that no slag can get above the tuyeres. Keep the slag running all the time. Suppose that you drop out the fluor spar and use 40 pounds of limestone on each charge.

BRASS FOUNDRY NOTES.

BY C. VICKERS.

Aluminum Bronze.

Inquiry. Can you please give me a mixture for aluminum bronze suitable for gears?

Ans. Copper, 90 per cent; tin, 8 per cent; aluminum, 2 percent.

Strong Brass or Bronze.

Inquiry. Can you please give me the composition of a brass or bronze which will stand 600 lb. per sq. in.? My order does not state whether it is steam or water pressure, but I think it is for a hydraulic bushing.

Ans. As it is an exceedingly poor alloy of bronze or brass that will not withstand a pressure of 600 or even 6,000 lb. to the sq. in. it seems to me 60,000 lb. pressure to the sq. in. is meant in place of 600 and that makes a considerable difference.

With phosphor bronze I never obtained more than 39,000 lb. per sq. in., with castings made under ordinary conditions.

The Tobin bronze alloys as given in the January *Foundry* are supposed to go over 60,000 lb. in tensile strength, but I cannot prove it, for I have never seen them tested.

Government specifications for manganese bronze, I understand, call for a tensile strength of 72,000 lb. per sq. in. Such an alloy is:

	Pounds.
Ingot copper	80
Manganese copper	8
Tin	6
Zinc	6

This will be difficult to cast sound and so will this, which is supposed to be stronger yet:

	Pounds.
Lake copper	96
Silicon copper	4
Aluminum	2

There is no doubt in my mind that considerable experimenting will be necessary before a satisfactory alloy for this pressure is found.

ASSOCIATIONS AND SOCIETIES.

New England Foundrymen's Association.

Fred F. Stockwell, Secretary, care of Barbour-Stockwell Co., Cambridgeport, Mass.

The annual meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, on Wednesday, Jan. 11, at 4 p. m. President B. M. Shaw presided.

Telegrams were received from the president and commissioner of the National Founders' Association regretting it would be impossible for them to attend and sending New Year's greetings to this association.

The committee appointed to secure information relative to the quiz topic brought up in the December meeting, viz: "What is the best fuel ratio which you have been able to obtain?" reported that after making several inquiries they received the following from Dr. Richard Moldenke: "When I ran a 50-ton heat out of a cupola 54 in. inside diameter, I obtained a fuel ratio of 1 to 10.1 for gray iron castings. The best I ever had was in melting white iron for pots, the heat being about 65 tons, and the melting ratio 1 to 11.8. Recent tests made by me at the St. Louis Model Foundry with cupolas 24 in. inside diameter and 3,000 lb. to the heat, gave good hot iron with Connellsville coke with a ratio of 1 to 7. A better ratio would have given dull iron. Then another test made by me at a large shop making heavy castings of gray iron had a melting ratio of 1 to 10.2. All these figures are regular runs. In general, I would say that for ordinary foundry work, with medium sized heats, a ratio of 1 to 8 is quite a good one, as the few cents spent in getting extra hot and clean iron are a good investment."

The treasurer reported a balance on hand Jan. 2, 1905, and all bills paid. The secretary reported 21 firms added to the rolls during the past year, making a total membership on Jan. 2, 1905, of 115 concerns and three honorary members.

The following is a list of the officers elected to serve for the ensuing year:

President, John Magee, Magee Furnace Co.

Vice president, Walter B. Snow, B. F. Sturtevant Co.

Treasurer, Geo. H. Lincoln, Geo. H. Lincoln & Co.

Secretary, Fred F. Stockwell, Barbour-Stockwell Co.

Executive committee: J. O. Henshaw, N. S. Bartlett & Co.; A. J. Miller, Whitehead Bros. Co.; Harry E. Gibby, Mechanics Foundry Co.; W. C. Doherty, Doherty Bros. H. A. Carpenter, A. Carpenter & Sons Foundry Co.

President Shaw spoke briefly on the work of the association and then requested Messrs. Carpenter and Geo. Gibby to escort the newly elected president to the chair. Mr. Magee thanked the members in a very pleasing manner for the honor bestowed upon him and also referred to what the association had done and to the field of effort before it in the future. He called upon other newly elected officers for a few remarks.

After a short intermission, during which the delegates from the Philadelphia Foundrymen's Association were received by the members, the meeting adjourned to dinner. Following the last course President Magee introduced Henry A. Carpenter, former president, as toastmaster of the evening and he was greeted with applause that extended for several moments. He extended cordial greetings to the guests from Philadelphia and to the members present.

Prof. Henry D. Metcalf, of Tufts College, was introduced as the speaker of the evening, and made an address on "Welfare Work for the Benefit of Employes," illustrating his remarks by stereopticon views.

President Magee extended cordial greetings to the representatives from the Philadelphia Foundrymen's Association, and after dwelling on the historical events connected with one of the oldest landmarks in Boston, presented them with a framed picture of Christ Church, Boston, more commonly known as the Old North Church.

The toastmaster called upon Dr. E. E. Brown, of Philadelphia, who responded happily, accepting on behalf of the Philadelphia Foundrymen's Association the beautiful etching and extending thanks for the gift. The toastmaster also called upon a number of other gentlemen whose responses in lighter vein contributed further to the good cheer of the occasion. The members were then entertained by a vaudeville smoker which rounded out an enjoyable and memorable occasion.

Pittsburg Foundrymen's Association.

F. H. Zimmers, Secretary, care Union Foundry & Machine Co.

At the meeting of the Pittsburg Foundrymen's Association on Monday evening, Jan. 9, much interesting information regarding cupola practice was brought out in the discussion of the fan and blower tests made at the foundry of Mackintosh, Hemphill & Co., Pittsburg, and detailed in the report of a special committee of the association. The committee's report was published in *The Foundry* for January. The experiences of the foundrymen who spoke at Monday night's meeting differed widely, the nature of the castings produced controlling the cupola practice almost entirely.

William Yagle in opening the discussion said that he was disappointed with the tests, on account of the high pressure used. In his foundry he has successfully operated a positive pressure blower for nine years, and while he admitted that the first cost was higher than for the installation of a fan, he said that repairs have cost him nothing in that period. He presented the results of several tests recently made at his plant and they are especially noteworthy on account of the very low pressure. The blower is a No. 6 Root and the cupola is 58 in. in diameter inside lining. On Jan. 6, 39,000 pounds of iron were taken from the cupola in two hours and the pressure was taken twelve times during the heat, showing an average of only 7 oz. The cupola is located 125 ft. from the blower. On Jan. 7 the average pressure was reduced to 6 oz., during a three-hour heat, when 51,000 pounds of iron were melted. This test shows a slight reduction in the melt, due, without doubt, to the reduction in pressure. On Jan. 10 the blast pressure averaged 5 ounces during the fore part of the heat, with an output of 7 tons of iron an hour, and with the pressure increased to 8 ounces the output was increased to 10 tons the second hour. Mr. Yagle concluded that it is not necessary to keep up the pressure to the point shown in the tests, as he is able to secure a very good output on low pressures. With reference to the statement that when running on the blower there is danger of cutting the cupola lining, he said that there is no more danger of this when the cupola is kept free and open than with a fan.

S. D. Sleeth, of the Westinghouse Air Brake Co., said that they installed six blowers in their foundry and after six months'

trial they were replaced with fans. At this plant the iron is melted continuously and the blowers were compelled to operate 23 hours daily. The blowers were operated at a pressure of 16 ounces and at the beginning of a heat would run up to 20 ounces. During the first few hours he said that the iron output would be good, but after that it would decrease owing to the tuyeres clogging up, and although the same amount of air would be delivered through the smaller opening, the same results would not be obtained as are obtained with the use of fans. Regarding the life of fans he said that they have used a No. 9 fan for 15 years, and during the period it was operated 23 hours every day except Sunday and required no repairs whatever. He also voiced Mr. Yagle's sentiments in not having the pressure too high, stating that no better results had been obtained operating at a pressure of 13 ounces than at 10. With a 60-in. cupola he said they are turning out 14 to 15 tons an hour with a pressure of 9 to 10 ounces.

In explanation of the tests W. H. McFadden, of Mackintosh, Hemphill & Co., said that they were made entirely under the supervision of the fan and blower manufacturers and by no means show the ordinary practice of his company. He stated that it was not out of the ordinary to melt 40 tons in three hours with their cupola.

B. D. Fuller, of the Allegheny plant of the Westinghouse Electric & Mfg. Co., said that they use fans entirely in their foundry and added that they have no trouble whatever melting as high as 17 tons an hour in a 60-in. cupola with a pressure ranging from 11 to 12 ounces and a variation in the horsepower required from 35 to 44. He also found that the fan required very little repairs.

"While the most of you do not consider that much has been attained by these tests," said A. W. Slocum, of the National Car Wheel Co., "I think they are invaluable. They furnish much data by which we can be governed in our future work, and while the tests as a whole might not govern our particular cases, there are points in these records which will be of value to each one of us. The reason, I think, that so many have been disappointed is that the results obtained do not apply to their own individual cases. We operate a 102-in. stack at a pressure of 6 to 7 ounces and melt 25 tons of iron an hour. Each foundryman has to operate his cupola according to the nature of his castings. In our case we look to transverse strength in our castings and use a fan, but if it were not for this one great factor I am inclined to think that we would install a blower."

The superintendent of one of the Pittsburg steel works foundries running on ingot molds then related his experience with fans of different types. He said that there were four fans in use at the foundry, of two different types. It was believed that the horsepower required to operate them was too high and as it was not desirable to install a new engine, tests were undertaken by which the horsepower could be reduced, and at least the same blast pressure maintained. First, tests of the fans of the same type operating together were made, then tests with one of each type were carried out. While the fans were of the same number they varied considerably and it was decided to install four fans of one type, with the result that the horsepower was reduced from 290 to 253 and at the same time the pressure was increased from 7.9 to 9.5 ounces.

Another foundryman stated that they had a No. 10 blower in use which required 450 amperes and the circuit breaker was going out almost continually. A smaller blower was installed, No. 9, resulting in reducing the amperes to 200 and doing the same work the larger blower was doing . Another foundryman stated that the size of scrap charged had little to do with the melting capacity of the cupola so far as his experience goes. He operates a No. 10 fan with a 75-h. p. motor to furnish air for a 76-in. cupola inside lining, and run from 115 to 120 tons of iron in eight hours on a 12-ounce pressure. Machinery scrap weighing from 500 to 600 pounds is oftentimes charged, but he added that these results could not be obtained with a blower. It was also related that one of the large steel works melting its iron in cupolas for use in the Bessemer process had replaced blowers with fans.

A resolution of thanks was voted Mackintosh, Hemphill & Co. for their interest in making these tests and for the expenditure connected therewith.

The invitation of the New England Foundrymen's Association to the members of the Pittsburg association to attend the meeting at Boston on Jan. 11 was acknowledged with a unanimous vote of thanks. Luncheon was served after adjournment.

The first heat was run off at the new Diamond Iron Works, at Muskegon, Mich., on January 11th.

Philadelphia Foundrymen's Association.

Howard Evans, Secretary, care of J. W. Paxson Co.

The 143d meeting of the Philadelphia Foundrymen's Association was held at the Manufacturerers' Club, Philadelphia, on Wednesday evening, Jan. 4, with President Thomas Devlin in the chair. Thirty-two members and visitors were present. Before the papers of the evening was taken up attention was called to the invitation of the New England Foundrymen's Association to meet with them on the occasion of their next annual meeting, on Jan. 11, at the Exchange Club, Boston, Mass.

S. E. Barnes, foreman coremaker of the Deane Steam Pump Co., Holyoke, Mass., was called upon to present his paper on "Automatic Core Ovens Using Oil as Fuel." The paper was discussed at some length after which the thanks of the members were tendered to Mr. Barnes.

New York Foundry Foremen's Association.

S. M. Williams, Dist. Vice Pres., 221 Third St., Elizabeth, N. J.

The monthly meeting of the New York Foundry Foremen was held at Hotel Montgomery, with President Thomas in the chair. After the reading of the minutes of the last meeting and other routine business, Dr. Moldenke gave an address in which he touched upon a number of points. First, he stated that the annual meeting of the American Foundrymen's Association would probably be held in Alabama, and he pointed out the advisability of having all of the foundry foremen, as well as foundrymen, who possibly could attend this meeting, make plans to do so, as it is the intention to make arrangements to visit some of the large southern foundries.

Dr. Moldenke also told of his experience in connection with the coking tests carried on by the U. S. Government at the Louisiana Purchase Exposition in the model foundry and coking plants there. Nineteen tests have already been run on different grades of coke made from coal from different parts of the United States, and as it is evident that these tests are going to be of value, Congress has made an additional appropriation for the continuation of the tests throughout the coming year, and arrangements will be made with the city of St. Louis, by which the plant will be maintained for another year. The results of these tests will be published as a Congressional document, which can be obtained through Congressmen.

Prof. Stoughton, of Columbia University, was next introduced and described the new process which is being experimented with in Canada for reducing ores by electricity. He stated that if this process could be carried on cheaply enough, pig iron could be produced which was absolutely free from sulphur, and that, with the use of water power, it now looked as though the experiments would be successful, and hence in the future we might look for iron of this character. He pointed out the great advantage that such a metal as this would be to the foundrymen, and that this and other matters which came up recently in foundry practice were tending toward quite a decided revolution, especially in cupola practice.

Cleveland Foundry Foremen.

W. H Nicholls, 608 Gordon Avenue, District Vice President.

The Cleveland Foundry Foremen held their regular meeting on January 5th. It was their annual election of officers, and Mr. Holt, of the Interstate Foundry Co., was elected president, Mr. Harry Hoover, of the Cleveland Steel Casting Co., first vice president, and Mr Wm. Kerr, of the Chisholm & Moore Co., second vice president. Mr. W. H. Nicholls, of the Hill Clutch Co., was re-elected secretary and treasurer. The new officers were installed at once, the new president thanking the club for the honor in a few well chosen words.

Mr. Wadswerth and Mr. Rath will give a talk at the next meeting on molding machinery, Mr. Wadsworth intending to have a machine fitted up for demonstration in connection with the talk. Mr. H. M. Lane, editor of *The Foundry*, gave a talk on past and present methods of producing cast iron, and their effect on grading and fracture of the same. There was a good attendance at the meeeting and the affairs of the association are in a prosperous condition.

THE ASSOCIATED FOUNDRY FOREMEN.

Frank C. Everitt. Secretary, 2413 Third Ave., New York, N. Y., care The J. L. Mott Iron Works.

ERIE FOUNDRY FOREMEN.

W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

INDIANAPOLIS FOUNDRY FOREMEN.

W. H. Holmes, Dist. Vice Pres., care American Foundry Co.

CHICAGO FOUNDRY FOREMEN.

David Spence, Dist. Vice Pres., 142 Bunker St.

MILWAUKEE FOUNDRY FOREMEN.

Thomas Glasscock, Dist. Vice Pres., care Pawling & Harnischfeger Co., Milwaukee, Wis.

A NEW BOOK.

The Mechanical World's Pocket Book and Diary for 1905 has just been published. This is quite a novel publication and is furnished at sixpence net. We presume that postage will be in addition to this. In the first place, it is a practical hand book containing logarithm tables, tables of squares, cube roots, circles, properties of saturated steam and many other useful tables which would be of interest to any shop man. It contains considerable matter upon gearing and gear problems and also a good deal of matter upon machine design in various forms. Power transmission is covered quite extensively, in fact, it is a good general pocket book. Following the pocket book portion there is a series of blank pages forming a diary for 1905. The book is 4 by 6½ inches and neatly bound in cloth. It is published by the *Mechanical World*, Newbridge St., Manchester, England.

TRADE PUBLICATIONS.

The Universal Iron Works, of Brooklyn, N. Y., have issued a very striking calendar, purporting to be a night scene taken on Broadway from just above the Flatiron Building, New York City. In the fore-ground are people passing to and fro across the street in the light of the electric lights, while just behind them is a wagon load of castings from the Universal Iron Works, their sign being displayed on the side of the wagon. In the background the Flatiron building towers into the sky.

The John Williams Bronze Foundry & Iron Works, manufacturers of architectural bronze and iron work and of sculptural bronze work, have issued a very fine calendar having on it a process cut of a bronze casting just as it comes from the mold. It is a tablet upon which are inscribed the words "American Art in Bronze and Iron" and above it is an eagle and below it some fruit and flower work. The printing on the body of the calendar is done in a greenish tint on a white ground. Below it is mounted a very neat calendar pad having numbers which can be seen quite plainly.

The Washington Coal & Coke Co., of Pittsburg, Pa., have issued their diary for 1905, which is a very neatly printed book, with half pages devoted to each day in a diary for the entire year, together with a number of pages of useful information. In the back and front are photographs of the mines of the Washington Coal & Coke Co., and a short advertisement of their products.

Chas. G. Shepard, of 401 Ellicott Square, Buffalo, N. Y., pig iron and coke dealer, has issued a calendar which consists of a black card with a black calendar and white figures mounted on the lower portion of it. In the upper portion of it there is an embossed symbolic picture which is very neatly gotten up. In fact, the calendar is a work of art.

The McCullough-Dalzell Crucible Co., of Pittsburg, Pa., are sending out their usual calendar, which all who are familiar with it will welcome. It is simply a plain business calendar, including a picture of their works and a short advertisement, below which there is a large calendar of good black figures which can be seen for some distance. The figures are a little over an inch in height. They are also sending out a very neat paper weight, which is composed of a wooden block upon which is mounted a small crucible. Upon the beveled edges of the block are printed a few lines showing what the company makes.

The Resinol Chemical Co., of Baltimore, Md., are sending out a very unique calendar entitled "A Record of Baby's Doings." It contains juvenile pictures and on the back of each sheet there are blanks for recording all the doings of the youngster, from his first advent until he is able to make his wants known and extend his domain to visits to Sunday school and church.

E. E. Dempwolf & Sons have issued a calendar advertising their hydrofluoric acid, which consists of a very nicely gotten up picture of an Indian girl, dressed out in all her finery and sitting upon the limb of a tree. Below are a few lines of advertisement and then a neat calendar pad.

The West Side Iron Works, of Grand Rapids, Mich., have issued one of the neatest calendars we have seen. It consists of a black mount, upon which there is a picture of a girl carrying a large vase of flowers. The effect is that of a soft crayon picture. It is entitled "A Breath of Spring." Below the picture is mounted a small calendar with black paper and white figures.

REVIEWS.

The New English Pig Iron Contract.

The Ironmonger, Dec. 24.

Among the items of interest to American foundrymen in connection with the new contract for buying and selling pig iron warrants in England, are the following: Warrants are strictly limited to approved brands only, and these must conform to the following standards of analysis. Grade No. 1, silicon 2.50 to 3.50; phosphorus not over 1.65, and sulphur not over 0.035. Grade No. 2, the same, but sulphur not exceeding 0.045. Grade No. 3, silicon 1.75 to 3.00; phosphorus not over 1.65; sulphur not over 0.060. Grade No. 4, silicon 1.50 to 2.50; phosphorus not over 1.65; sulphur not over 0.80.

Each 500 ton lot shall be sampled by a recognized chemist, by taking ten pigs for every 100 tons, and drilling half way through the side of each. The samples are divided into three portions and two are analyzed by two chemists, the third being retained for an umpire if necessary. All charges paid by the seller.

Among the string of brands which are approved, there is a nice list of our Alabama and Tennessee irons.

In view of the above very wide range allowed for the constituents in the iron, and the very weak sampling method, there is little wonder that the English irons recently imported gave so much trouble in our foundries. The Germans took better care to keep to closer compositions, and therefore will reap their reward should iron prices here soar upward again, enabling importation.

The above specifications when contrasted with those advanced by the American Society for Testing Materials, which are the American Standard, show how much closer our furnaces must work to the given line. They can easily do it too.

Annealing of Crucibles.

The following suggestions are offered and will be found perfectly expedient in every brass foundry:

Unpack the crucibles and place as many of them as possible on the flues back of the furnace. Here they will be heated to a sufficient degree so that they cannot be handled without burning the fingers. They should be left in this position from one to three weeks.

At night, after the fires are drawn from the furnace, and the furnace is allowed to cool for, say, fifteen minues, open the furnace wide, lay a shank across the top, place a crucible on the shank (mouth down) over the center of the furnace so that the remaining heat in the furnace will come up during the night and strike not only the inside but also the outside of the crucible. Repeat this three or four times.

Draw the fires as before, allow the furnace to cool twenty to twenty-five minutes, place the pot (mouth down) on the grate bars of the furnace, allow it to remain all night. Repeat this the second night, only giving the furnace ten or fifteen minutes to cool off. Repeat again the third night, and this time leave the cover on the furnace.

By this method a crucible will be brought up to a red heat slowly and gradually, and whatever moisture may have been within the walls will be expelled without any steam. It is the expansion of the moisture and the generation of steam which blows a piece, or flakes off the pot.

Some foundrymen will say that so much annealing is unnecessary; that they have followed a different practice for twenty years and have had very little trouble. The answer to this is: Scalps are not of frequent occurrence, and it might be a year or two between troubles of this kind, but when they *do* occur they are expensive. It is not every shipment that gathers moisture. We have seen crucibles taken out of the cask and immediately put into the fire without detrimental results, but the user is assuming considerable risk in so doing.

As an evidence that this "flaking off" is caused by moisture, we would say: Nobody ever saw a crucible scalp after it had safely gone the first heat, which is proof positive that the bringing of the crucible up to the heat necessary to melt brass, expels from it *all* the moisture, consequently after the *first* heat there is no danger of a scalp.—*Dudley A. Johnson, in Graphite.*

Manganese Ore for Desulphurizing Cast Iron.

Stahl und Eisen, Nos. 22 and 23, 1904.—Dr. Wedemeyer discusses the much vaunted advantage of adding manganese ore to the cupola and furnace, with the cost this adds to the metal produced. Condensing his numerous tables we find that adding 1 percent of manganese ore (50 percent Mn.) with 4 percent limestone, the original sulphur of the iron was increased from between 0.020 and 0.030

to 0.050. With 1.4 percent manganese ore and 4 percent limestone, this increase was still higher, being 0.055. With 4 percent manganese ore and 4 percent limestone, the sulphur remained about the same as in the iron originally. Other experiments along the same lines brought Mr. Wedemeyer to the following conclusions: That with only small amounts of manganese ore added, the effect on the sulphur is hardly noticeable. Only with very large amounts of the ore is it possible to keep the sulphur out of the iron, and none is removed from it. That this method is out of proportion expensive. That it is possible to arrive at just as good results with the proper use of limestone.

Proceedings of the German Foundrymen's Association.

Giesserei-Zeitung, Dec. 15, reports the convention of Dec. 3, held at Duesseldorf. This gathering was specially notable in that for the first time in the history of the association, which is convened purely for making business agreements, a separate gathering of foundry experts took place. The German foundry industry was therefore very much interested in the outcome of this gathering.

About 800 members and guests were in attendance, which alone would show the great interest taken in the foundry revival of our future competitor. Mr. Kurt Sorge, of the Krupp works, presided, and emphasized the fact that Germany felt the want of expert advice in foundry matters very badly; that her foundrymen were too little acquainted with the technical side of their industry; that this was the natural consequence of the lack of foundrymen's associations making the study of foundry processes their chief study. Mr. Sorge pointed out the benefit which is derived from active and systematic work along scientific lines in the foundry industry, by referring to the good work of the American Foundrymen's Association, and urged his friends to follow suit.

The status of the present movement in Germany is interesting. It seems that the German Foundrymen's Association is working in cooperation with the German Iron and Steel Institute, sections of each uniting for technical discussion. The two associations arrange for simultaneous meetings, one taking the foundry section at its winter meeting, and the other at the summer gathering.

After the election of officers, the reading of papers was begun. The first one was by Director Friem, of Neuberg, on casting defects in steel ingots. The next paper was by Dr. Wedemeyer on the Lochner system of drying molds. This being done with blast furnace gases. Finally a paper by Dr. Nathusius, on the magnetic properties of Cast Iron. These papers will be reviewed separately when the full text is received.

The regular meeting of the Foundrymen's Association was then called to order, under the direction of Dr. Lueg. He devoted much time to a discussion of the newly formed German steel trust, the sum and substance of this being that by regulating prices in Germany among themselves the producers affected are able to devote special attention to us in the way of competition in exporting.

The only paper read of special value to us is that by Prof. Wuest, on the valuation of pig iron for foundry purposes. This will be reviewed later.

PERSONALS.

Lewis F. Patterson resigned his foremanship at the A. Carpenter & Sons Foundry, Providence, R. I., to take charge of the United Shoe Co.'s new foundry at Beverly, Mass., on Jan. 1, 1905.

R. H. Palmer, formerly foreman of Clark Bros. Foundry, Belmont, N. J., has accepted the foremanship and taken charge of the Perkins Machine Co.'s foundry at Warren, Mass.

Mr. Dan Galvin, of Paducah, Ky., is probably the only individual molder in the United States who had an exhibit at the Universal Exposition at St. Louis. He had on exhibition three very interesting brass castings, for which he received a bronze medal.

Thos. Robertson, foreman of the Gould foundries in Seneca Falls, N. Y., has resigned and accepted a similar position in Indianapolis, Ind.

H. C. Royce, formerly foreman of the Virginia Iron Works, of Virginia, Minnesota, who, since the absorption of that company by the Virginia Foundry & Machine Co., has been prominently connected with the latter company, has resigned his position and gone to Hoquiam, Washington, where John Stein, formerly of the local iron works, has erected a plant, and will conduct a foundry business.

C. J. Houck, foundry manager at the plant of the Illinois Sewing Machine Co., Rockford, Ill., was presented with a loving cup recently by members of the foundry force, as a token of their personal esteem for him.

J. C. Pierson, president of the Garwood Foundry Co., has resigned and H. A. Wilson has been elected to succeed him. C. O. Poor, of Westfield, N. J., was elected vice president and treasurer, and R. A. Becker, of New York, secretary. The concern manufactures castings for the Hall Signal Co. Mr. Pierson is a resident of Plainfield, N. J.

Robt. Campbell, who has been with the Gadsden Pipe & Foundry Co., of Gadsden, Ala., ever since it was established four years ago, has resigned that position to become general superintendent of the Coosa Pipe & Foundry Co., recently incorporated, in Gadsden, Ala.

Thos. J. Foley, of Schenectady, N. Y., has been appointed by Supt. MacNaughton assistant foreman of the molding shop of the Brooks Works of the American Locomotive Works.

John C. Knoeppel, of Oswego, N. Y., has resigned his former position to accept the position of foundry foreman with A. Carpenter & Sons, Providence, R. I.

DEATHS.

John J. Anderson, of Bridgewater, Pa., who for twenty years has been manager of the Anderson Foundry Co., died in Pittsburg recently. He was originally connected with the Hecla foundry, but he sold out this business and started the Anderson foundry.

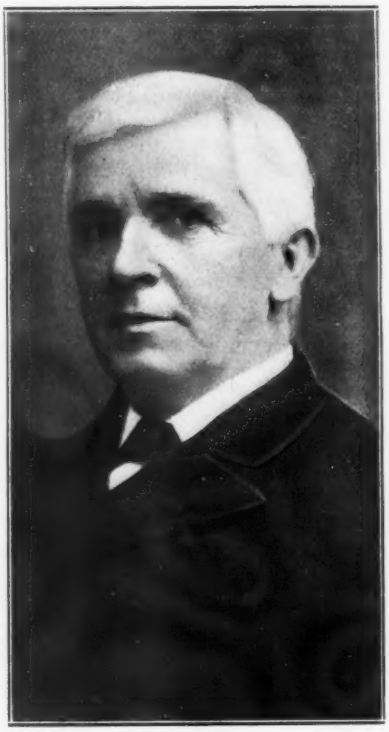
Henry J. Taillie, of Rochester, N. Y., died Jan. 8. Mr. Taillie was 69 years old and has been connected with the foundry business of Rochester during most of his life, having engaged in business with Sebastian Shorer in the foundry on North Water street in 1872. In 1891 he retired from business and was in good health until recently.

J. Emory Jones, president of the Eagle Foundry & Machine Shop, of Rochester, N. Y., died on Dec. 29. He was 64 years of age and among the best known men in Rochester. He was the son of Ezra Jones, who established a foundry on Brown's Race, and since the death of the father a few years ago Mr. Jones has conducted the business. The firm was originally known as Ezra Jones & Son, but since the death of his father Mr. Jones has carried it on under the name of the Eagle Foundry & Machine Shop.

The Bristol Co., of Waterbury, Conn., have been awarded a medal and diploma for their exhibit of recording instruments at the St. Louis Exposition.

THE LATE CHARLES S. BELL.

Charles S. Bell died from an attack of heart disease, superinduced by Bright's disease, from which he had been a sufferer for several months. Mr. Bell was born in Maryland, Feb. 6, 1829, and after attending the public schools until 15 years of age, found employment in a



CHAS. S. BELL.

machine shop in Pittsburg, where he learned the trade. He went to Hillsboro in 1858 and started a small foundry. The business gradually increased until the large plant now occupied was built and the C. S. Bell Co. was organized, the other stockholders being members of Mr. Bell's family. This concern, the products of which are farm and church bells and cane mills, is one of the largest of its kind in the United States, and its trade extends to all quarters of the civilized world. Its great success is due largely to Mr. Bell's energy, enterprise and personal management which continued uninterruptedly up to the time of his last illness, excepting for brief periods when he traveled extensively in this country and Europe. Mr. Bell was deeply interested in matters pertaining to the public

welfare, had given much time to general reading and was cultured to an unusual extent for one of so limited schooling.

FIRES.

The plant of the Natl. Foundry, Mfg. & Supply Co., of Williamsport, Pa., was damaged by fire on Dec. 18. The fire originated in the core department and was discovered by some persons residing near, who fought it with snow for some time and thus prevented it from doing more extensive damage. After the fire department came they soon got it under control.

Damage to the amount of $4,000 was done to the Pittsburg Foundry, Denver, Col., Jan. 2, by fire.

The Crompton & Knowles Loom Works at Worcester, Mass., was damaged by fire to the extent of $500 on Dec. 23. The fire was not sufficient, however, to interfere with work at the plant.

The foundry of the American Car & Foundry Co., at Berwick, Pa., was totally destroyed by fire recently, entailing a loss of $40,000 and throwing 190 men out of employment. It is probable that in rebuilding they will remove to some other site.

The foundry of the London Brass Co., of London, Ont., was damaged by fire recently to the extent of between $2,000 and $3,000, which was covered by insurance.

The foundry of the J. A. Willis Machine Shops, of Columbia, S. C., was damaged by fire slightly on Dec. 30. It was supposed that the fire originated from sparks which lit in a sparrow's nest in the eaves. The loss was totally covered by insurance.

The shops of the Mobile, Jackson & Kansas City railroad at Ripley, Mass., were burned Dec. 29, causing a loss of $10,000.

Fire on the night of Dec. 31, on Van Buren street, Chicago, resulted in a loss of $600,000 and injured about 13 men. Among the larger losers was the Peninsular Stove Co., whose loss was estimated at $225,000.

Fire on the night of Jan. 2 destroyed the Ruth Roller Works, Hattiesburg, Miss. The plant was valued at $3,000 and was insured for $1,200.

The Nacogdoches Iron Foundry, owned by Y. F. Mize, of Nacogdoches, Texas, was damaged by fire recently to the extent of $1,000.

The Mitchell-Van Meter Co., of Linfield, Pa., will build an addition 40 by 100 ft. to their foundry.

NEW CONSTRUCTION.

The Kuhn Foundry Co., Buffalo, N. Y., has been incorporated with a capital of $15,000. Incorporators are: Joseph Kuhn, E. A. Konzelman and John Doughton.

The Erie City Iron Works has increased its capital from $1,000,000 to $2,000,000. The company is now building a large addition to its boiler shops and contemplates some other changes during the year, for which plans have not yet been completed. The company states that its outlook for trade is very encouraging and that it is expecting a large business during 1905.

An addition to the foundry of Schaum & Uhlinger, of Philadelphia, Pa., will be built in the near future. The new building will be 115 by 80 ft.

Floyd, Wells & Co., of Royersford, Pa., will build an addition to their foundry 78 by 96 ft.

The Crompton & Knowles Loom Works, of Worcester, Mass., have had plans prepared for an addition to their branch works at Philadelphia.

The Joseph Dick Agricultural Works, of Canton, O., are enlarging their foundry by constructing a new building 60 by 126 ft.

The J. V. Newlin Mfg. Co., of Sebring, O., has completed the erection of its new foundry and expects to build a machine shop in the spring. The foundry is 60 by 80 ft.

The Crawford-McCrimmon Co., Brazil, Ind., will erect a foundry 150 x 50 ft., with complete modern equipment.

The Southern Metal & Mfg. Co., St. Louis, Mo., will erect a foundry at Litchfield, Ill.

The Singer Mfg. Co. has acquired the land and buildings formerly occupied by the Henry R. Worthington Pump Works at Elizabeth, N. J. The company has requested the council to vacate a street, as the company desires it for the enlargement of its works, but it advises us that it is not at present making additions to its plant.

It is reported that the Jas. T. Powers Foundry Co., of Elkton, Md., will enlarge its plant and erect a new pattern shop.

Eugene Victori & Sons, of Jersey City, N. J., will erect a new building on New York avenue and Blum street, Union Hill, which will by 25 by 50 ft. and will be used as a workshop and foundry.

The Mt. Vernon (Ill.) Car Mfg. Co. is putting up an addition to its wheel foundry, 30 by 200 feet.

Plans are being rapidly completed for the erection of a new plant for the Standard Sanitary Mfg. Co. to adjoin its present works on Jarvis avenue, Louisville, Ky. A new foundry will be built, 300 x 120 ft., a large power plant will also be added. The enlargement will require the employment of 200 additional hands, making the total force 1,100 men. Work on the new structures will begin about Feb. 1, and is expected to be completed about June 1. The construction will be entirely of steel with concrete walls. Ample railroad facilities are being provided with switches from both the Louisville and Nashville and the Southern railway. The company has other plants at Pittsburg, New Brighton, Pa., and Rome, N. Y.

The Sumter Machinery Co., Charleston, S. C., will soon start the erection of foundry and machine shop buildings.

N. Harrison, of Ocala, Fla., has commenced work on the construction of his new foundry and machine shops.

The Smith plant of the Continental Gin Co., of Avondale, Ala., will be enlarged and the capacity of the foundry doubled. The cost of the improvements will amount to $50,000.

The Jewett Stove Co., which recently purchased the plant of the American Cabinet Co., Tonawanda, N. Y., has begun the construction of a foundry which will be ready for operation by May 1.

Plans have been prepared for a $10,000 1-story brick foundry building for Werner & Pfleiderer, of Saginaw, Mich.

John McLean & Son, Birmingham, Ala., formerly with the Avondale Stove & Foundry Co., have purchased the plant of the Eureka Foundry & Machine Co., Birmingham, and plans are being drawn to adapt the plant to the use of the new owners. A large building is to be erected and considerable machinery will be purchased.

The Canadian Pacific railroad has just completed a very large and thoroughly equipped car shop plant near Montreal. The plot of ground is 4,700 ft. long and 200 ft. wide. The principal buildings are: Locomotive shop, 163 x 1,168 ft.; general stores, 85 x 594 ft.; iron foundry, 122 x 342 ft.; wheel foundry, 107 x 187 ft.; smith and forge shop, 300 x 433 ft.; pattern shop and store, 50 x 232 ft.; car machine shop, 130 x 288 ft.; frog shop, 116 x 263 ft.; truck shop, 82 x 434 ft.; freight car shop, 107 x 540 ft.; two passenger car shops, each, 100 x 672 ft.; power house, 101 x 168 ft.; office, three stories, 57 x 81 ft.

GENERAL INDUSTRIAL NOTES.

The bell plant and the good-will of the Henry McShane Mfg. Co., Baltimore, have been purchased by W. M. Cary Jr., from the receivers for $20,000. Mr. Cary will continue to operate the plant.

The Reeves Foundry Co., of Trenton, N. J., has been incorporated with a capital of $50,000. The incorporators are: Clifton Reeves, Charles M. Heath and W. A. Holcomb.

A bid of $275,000 has been made by eastern capitalists for the Coxey Steel & Silica Sand Co., of Mt. Vernon, O., which has been in the hands of a receiver for more than a year.

The old Ellis Foundry Co., at South Carver, Mass., has closed its plant and this marks the close of a very interesting iron industry. Originally, the plant was intended simply for the production of pig iron, but about 75 years ago it was converted into a cupola foundry. In the earlier days it used the bog iron ore secured from the surrounding ponds and swamps. The Murdock family have owned the plant ever since it was established. Projectiles were made there for the Revolutionary war and the War of 1812, and many of the shells used in the Civil war were cast there. The plant has always had a high reputation for manufacturing hollow ware.

The Hekla Iron Works, of Brooklyn, N. Y., have increased their capital stock from $250,000 to $500,000.

The Colonial Brass Co., of Cleveland, O., has increased its capital stock from $60,000 to $125,000.

The Fort Wayne Foundry & Machine Co., of Fort Wayne, Ind., has filed a notice of the reduction of its capital stock $90,000, or 30 percent of its entire capitalization.

The Southern Skein & Foundry Co., of Hamilton Co., Tenn., has been incorporated with a capital of $100,000. The incorporators are: Jas. K. Jones, John G. Johnson, Gilbert N. Prentiss, Haley S. Probasco and Frank A. Nelson.

The Avondale Stove & Foundry Co., Birmingham, Ala., recently placed in the hands of a receiver, on account of the disagreement of stockholders, has been purchased by Perkins Ellis, Thomas Ellis and Frank Ellis. Since the organization of the company the plant has made a good record and has been a paying investment. It has an output of 200 stoves a day.

The plant at Anniston, Ala., of the Illinois Car & Equipment Co., formerly operated by

the Southern Car & Foundry Co., has been sold to the Western Steel Car & Foundry Co., of Chicago. The malleable and soft iron foundries will be rebuilt and some changes will be made to other buildings. H. A. McCord, president of the Illinois Car Co., will be general manager of the plant at Anniston.

D. T. Williams, for 15 years with the Lunkenheimer Co., has organized the D. T. Williams Valve Co., Cincinnati, which has been incorporated with $50,000 capital all subscribed. The officers and incorporators are D. T. Williams, president; F. X. Pund, vice president; J. W. Tarbell, treasurer; F. L. Swanberg, secretary, and W. J. Munster. The company has taken a five years' lease on a building at Broadway and Eggleston avenue and is now adapting it for the purpose of manufacturing valves, lubricators and oil and grease cups. Mr. Williams is now placing orders for equipment and hopes to have the new plant in operation by Jan. 1.

The McCullough-Dalzell Crucible Co., of Pittsburg, Pa., have just completed the erection of a new dry house, which is one of the buildings used in connection with the manufacture of crucibles, it being necessary to dry the imported clay and expose it to considerable heat for some time before using it in the manufacture of crucibles.

The Bloomington Iron and Brass Foundry, Bloomington, Ill., has been incorporated with a capital of $10,000, to do a general foundry business. Incorporators are: W. E. Allen, J. F. Narwood and H. I. Strech.

The Battle Creek Iron Works Co., and the Coburn Machine Co., both of Battle Creek, Mich., have consolidated their interests and will be known in the future as the King Gas & Gasoline Engine Co. The capital stock of the new company is $100,000 and the surplus $25,000, all paid in. The new officers will be selected in the near future, and in the meantime Mr. Sylvester Greusel, secretary of the Battle Creek Iron Works, will be in charge of the interests of the new company. They will manufacture gas engines of all kinds.

J. W. Duntley, president of the Chicago Pneumatic Tool Co., has gone on a four weeks' business trip to Europe, the object being to open the company's new plant in Scotland. Mr. Duntley announced before leaving that the company had made a contract to supply pneumatic tools to the largest shipbuilding yard on the Clyde and a three years' contract with the German government to supply its ship yard with tools.

The Brantley Mfg. Co., Birmingham, Ala., has been incorporated with a capital of $100,000, of which $50,000 is paid in. The company will do a general foundry and machinery business and engage in the manufacture of cotton gins, cotton mill machinery and cotton seed oil mill machinery. Incorporators are: J. S. Boggs, Albany, Ga.; Ben T. Wade, Troy, N. C., and H. Linden Zell, Birmingham.

Because of the similarity of the name of another corporation in the same city, which has caused a good deal of inconvenience, the Harman-Cogger Co., of Bloomsburg, Pa., has changed its name to the Bloomsburg Foundry & Engineering Works.

The Herron-Brady Pump & Foundry Co., Chattanooga, Tenn., has been awarded the contract by the Panama Canal Commission for furnishing hydrants and valves in constructing the Panama Canal.

The Sumter Foundry & Machine Works, Columbus, S. C., have been incorporated with a capital of $12,000. Incorporators are: R. I. Manning, C. G. Rowland and George D. Shere.

The Parsons Foundry & Machine Works, Parsons, Kan., have been sold by Otto Haubold to Millard F. Smith, who will remove the machinery from his old plant to that of the plant recently purchased.

The third annual banquet given by the A. Carpenter & Sons Foundry Co., Providence, R. I., to the heads of departments was held a few days ago and was a delightful event. The guests presented to the officers of the corporation a handsome portrait of Henry A. Carpenter, treasurer and general manager. Lewis F. Patterson, foundry foreman for the past six years, was present, as was also his successor, John C. Knoeppel, of Oswego, N. Y. Mr. Patterson was recently presented a gold watch by the employes of the foundry.

The Syracuse Foundry Co., of Syracuse, N. Y., has elected the following officers for the ensuing year: President, Robert Love; vice president, Louis H. Kruger; secretary and treasurer, F. R. Todd; and general manager, Geo. J. Hessler.

John P. Abbott has been appointed receiver of the Findlay-Otten Foundry Co., Buffalo, against which concern a petition in voluntary bankruptcy was recently filed. The company manufactured foundry supplies and castings.

Barz, Wygant & Brown, Hornellsville, N. Y., will erect an iron and brass foundry to supply their works with castings. Machinery for the foundry has been purchased.

The application of the Thomas D. West Foundry Co., Sharpsville, Pa., for a Pennsylvania charter was simply to change from an Ohio corporation to a Pennsylvania corporation.

The Fischer Foundry & Machine Co., which builds rolling mill glass works and general machinery, has contracted with Badische Maschinen-Fabrik, Durlach, Baden, Germany, for a complete outfit for making specially high grade steel castings by the Raapke process. The plant will be installed at the foundry and machine works of the company in Pittsburg or at its new works at Ford City, Pa. The Raapke process is in successful operation in Germany and France.

It is reported that the American Car & Foundry Co. will purchase the Anniston, Ala., foundry plant of the Illinois Equipment Co., thus giving it an important plant in the South.

The Catawissa Car & Foundry Co., Catawissa, Pa., has been absorbed by the Pennsylvania Car Works, which will put the plant in operation early this year.

The molders at the plant of the American Steel Foundries, Chester, Pa., are preparing molds for some of the largest castings ever made in the State, there being 20 pieces, each requiring 120,000 lb. of steel, to be used in the construction of the new Brooklyn bridge at New York.

The Eureka Foundry Co., of Cincinnati, O., at its annual meeting re-elected the old board of directors and the old officers. The officers of the company are: President, Henry J. Gosiger; vice president, John H. Tepe; treasurer, Jacob C. Lebeau; secretary, Paul A. Gosiger. The company is evidently in a very prosperous condition, for it reports a surplus of $51,000, in addition to its capital stock of $66,500.

Frank E. Stoneman, formerly president of the Columbus Skein & Iron Works, Columbus, O., has resigned from the Columbus plant and expects to devote his time to the development of iron ore and lead interests in the South. Geo. W. Loughman, formerly mayor of South Bend, Ind., will succeed Mr. Stoneman as manager of the Columbus plant. Wm. D. McCullogh, formerly secretary of the company, has been promoted to the position of assistant manager of the Columbus plant. The Columbus Skein & Iron Works is now one of the constituent companies of the American Skein & Foundry Co., with head offices at Chicago, Ill.

The Keasey Pulley Co., Toledo, O., has purchased the plant and business of the Wales Pulley Co., Swanton, O., and will remove the plant to Toledo after Feb. 1. The Keasey Co. is erecting a plant near Toledo.

The Best Foundry Co., of Cleveland, O., has been incorporated with a capital of $150,000. The incorporators are: G. B. Siddall, F. A. Quail, John MacGregor Jr., J. M. Henderson and Geo. A. Welch.

Sheriff S. P. Jones, of Cincinnati, O., has sold his interests in the West End Foundry, Cincinnati, O., to J. J. Bruce, who has been his partner for the last few years.

The American Bronze & Brass Co., of Cleveland, O., has been incorporated with a capital of $10,000 by W. J. Granger and others.

The Dana Mfg. Co., of Cincinnati, O., has purchased a lot on Beach street and will erect machine shops and a foundry at a cost of about $30,000.

The Peru Steel Casting Co., Peru, Ind., sustained a loss of $150,000 on the night of Dec. 20, in the destruction of its large plant, excepting four of the smaller buildings. The plant comprised five large buildings, one 600 x 80 ft., and nine smaller structures. The company was organized in 1901, with Philip Matter, of Marion, as president, and G. A. Swartwout, of Peru, general manager. The capital stock originally was $200,000, but later was raised to $600,000. At first the company employed 100 men and manufactured car couplers and other railroad castings. The business grew until in less than a year 600 men were employed. Two years ago there was a change in the management and the amount of work decreased until 200 employes were at work and finally the plant was closed entirely. It is feared that the plant will not be rebuilt.

The Brass Foundry Co., of Fort Wayne, Ind., has increased the capacity of its car wheel department and is pushing this portion of its work to the fullest possible extent to fill a large contract which it now has on hand.

The Smith & Babbitt Brass Foundry Co., of Chicago, Ill., has been incorporated with a capital of $5,000, to carry on a general machine shop and foundry business. The incorporators are: Benjamin F. March, Charles S. Graves, and Walter U. Eckert.

The Aurora Light & Stove Works, of North Aurora, Ill., has been incorporated with a capital of $10,000, to manufacture heating and lighting devices. The incorporators are: Karl C. Loehr, M. B. Rich and Ralph F. Potter.

The Chicago Hardware Foundry Co., of North Chicago, Ill., has increased its capital stock from $65,000 to $250,000.

The Peerless Kitchen Supply Co., of Chicago, Ill., has been incorporated with a capital of $5,000, to carry on a foundry and manufacturing business. The incorporators are: Albert H. Tyrrell, R. J. Fellingham and Elizabeth Halbert.

The American Car & Foundry Co., of St. Louis, Mo., advises us that the news item widely published stating that it is arranging to construct a large plant in England is erroneous.

The G. & D. Mfg. Co., of Streator, Ill., has been incorporated with a capital of $12,000 to manufacture implements and hardware. The incorporators are: Frank Gahm, C. L. Horn and Herman Derman.

The Colonial Brass Co., of Chicago, Ill., has been incorporated with a capital of $10,000 to manufacture brass goods. The incorporators are: Geo. J. Crane, Robert E. Gentzel and Frank L. Boyd.

The Allyne Brass Co., of Cleveland, O., has decided to open a branch in Detroit, and hence has incorporated under the State laws of Michigan as the Allyne Brass Co. of Michigan, with a capital of $25,000. The officers are: E. E. Allyne, president; R. H. White, vice president; Chas. B. Vohn, secretary and treasurer. It has already commenced work on its new plant and hopes to have it in operation early in the spring. The new plant is to be 80 by 155 ft.

The Milwaukee Coke & Gas Co., Milwaukee, Wis., will increase the capacity of its plant by the addition of 40 ovens. Work on the new equipment will commence this month.

Milwaukee is now the official headquarters of the Allis-Chalmers Co. The only department left in Chicago is that of the mining machinery. A branch office will be maintained there. The change has been made gradually since B. H. Warren was made president of the company about a year ago.

It is reported that a fine grade of molding sand has been discovered in Michigan about 150 miles from Detroit on the Pere Marquette R. R. If the sand now being tested proves to be as good as appearances indicate, the molders of that region are to be congratulated on having discovered a source from which they can obtain good sand at a smaller cost.

The foundry formerly owned by the Fountain City Drill Co., of La Crosse, Wis., has been used for some time as a storage warehouse and sales room for the Summit Stove Co., of Geneva, N. Y., and it is now planning to rebuild the old La Crosse foundry and refit it as a branch stove manufacturing plant.

The National Brass & Metal Co., of Minneapolis, Minn., has let a contract for the construction of a new two-story building 66 by 100 ft., to cost $8,000.

The Isthmian Canal Commission, Washington, D. C., has sent out proposals asking for bids on machine tools, machinery, hand cars, leather belting, rope, canvas and rubber hose, and miscellaneous supplies for its use at the Isthmus. Any one interested may get copies of the specifications by addressing the Isthmian Canal Commission, Washington, D. C.

The Trenton Hardware Mfg. Co., whose plant was recently destroyed by fire, has leased a building on Perrine avenue, Trenton, N. J., which it will equip for the manufacture of light castings. The company is in the market for tumbling barrels, etc.

The Virginia Stove & Mfg. Co., of Basic City, Va., is being organized with a capital of $30,000. The officers are: R. E. Edmonds, president; Wm. A. Pratt, vice president; A. L. Russell, general manager; and Geo. McCraig, secretary-treasurer.

The Wheeling Mold & Foundry Co., of Wheeling, W. Va., has increased its capital stock from $150,000 to $200,000, the increase being necessary to take care of its present volume of business. It is probable that practically all of the new stock will be absorbed by the old stockholders.

The Adair Machine Works Co., of Anniston, Ala., has changed its name to the Anniston Foundry & Machine Co. and increased its capital from $7,000 to $12,000. The officers are: H. B. Rudisill, president and general manager; E. T. Fields, vice president; E. L. Turner, secretary-treasurer; G. D. Adair, superintendent.

The Coosa Pipe & Foundry Co., of Gadsden, Ala., has been incorporated with a capital of $50,000. The incorporators are: T. G. and W. M. Bush, and C. L. Guice.

W. J. Oliver, railroad contractor and manufacturer of Knoxville, Tenn., has purchased additional property on the railroad at Knoxville and is planning to erect a large car wheel foundry.

H. A. Power has formed a company at Rome, Ga., to establish a stove foundry which will be operated on the co-operative plan.

The Maysville Foundry & Machine Co., of Maysville, Ky., has been incorporated with a capital of $60,000. The incorporators are: A. M. Danberry, L. F. Anderson and B. J. Gasner, all of Maysville.

The McDonnell Foundry & Machine Co., of Jackson, Miss., has been incorporated with a capital of $20,000. The incorporators are: Mrs. F. McDonnell, Geo., Frank and Charles McDonnell.

The Newport Iron & Brass Foundry, of Newport, Ky., has been merged into another corporation known as the Newport Foundry & Machine Co., incorporated in New Jersey, with a capital of $10,000.

The American Car & Foundry Co.'s plant at Binghamton, near Memphis, Tenn., which was recently purchased from the Southern Car & Foundry Co., is to be enlarged and the capacity of all the departments increased.

The United States Cast Iron Pipe & Foundry Co. has shipped 25 carloads of water pipe from its Bessemer plant near Birmingham to the Panama Canal Zone by way of Mobile. The company secured the contract for all the pipe to be used in the Canal Zone, aggregating 25,000 tons.

The United States Cast Iron Pipe & Foundry Co. contemplates putting in operation pit No. 6 at its plant at Anniston, Ala. It will only be necessary to erect two electric cranes and repair the pit in order to have it ready for operation. With this pit in operation the Anniston plant will be the largest pipe making plant in the South, as no other plant has more than five pits.

At the annual meeting of the Northwood Foundry Co., of Northwood, Ia., the following officers were elected: President, J. B. Thompson; vice president, T. O. Lund; secretary, Frank Forbes; treasurer, Dow Simmonds; manager, Ever Everson.

G. D. Berry, of the Berry Foundry & Machine Co., St. Joseph, Mo., has closed a contract with the Chicago, Rock Island & Pacific Railroad Co. to do the casting work of the company for the territory west of the Missouri river. The contract will amount to about $100,000 a year.

The Iron City Mfg. Co., of Pueblo, Col., is planning additions to its works which will very greatly increase the capacity of both its foundry and machine shop It has a large amount of work now on hand.

The Byron-York Machinery Co., of Pueblo, Col., manufacturer of the Byron gasoline engines, reports an extensive growth in the business during the past year, which has necessitated its increasing its business capacity and it is now moving into its new quarters, which will give it one of the best machine shops and foundries in the State.

The Electric Supply Co., of Sioux City, Ia., has started its new brass foundry.

The American Pattern & Machinery Co., of St. Louis, Mo., has been incorporated with a capital of $10,000. The incorporators are: Hiram Lloyd, Robt. C. Wright and Henry A. Hamilton.

Frank H. Teel, formerly foreman of the brass foundry of the Vaughn Machine Co., of Peabody, Mass., is going into business for himself and is starting a new brass foundry at Peabody, Mass.

At the annual meeting of the stockholders of the Plattsburg Foundry & Machine Co., Plattsburg, N. Y., the following officers were elected for the ensuing year: President, John M. Wever; secretary-treasurer, John Ross; general manager, S. S. Whittelsey.

The Niagara Falls Brass Works, of Niagara Falls, N. Y., has been incorporated with a capital of $20,000.

J. D. Tipple has leased the pattern shop in connection with the Mahoning Foundry & Machine Co., of Youngstown, O., and expects to carry it on as a jobbing pattern shop. Mr. Tipple was formerly foreman of the Forsythe Pattern Co.'s shop.

At the annual meeting of the stockholders of the Hooven, Owens & Rentschler Co., of Hamilton, O., the old board of directors was elected with one exception, the board being as follows: J. D. Schmidlapp and A. B. Vorheis, of Cincinnati; J. C. Hooven, G. A. Rentschler, Henry Sohn, Geo. H. Helvey, and C. O. Richter. The directors immediately organized by electing the following officers: President, J. C. Hooven; vice president, G. A. Rentschler; treasurer, Henry Sohn; secretary, C. O. Richter.

At the annual meeting of the Wilks Foundry Co., of Toledo, O., it was decided to increase the capital stock in order to increase the business. The following directors were elected for the coming year: M. J. Riggs, W. E. Brown, C. T. Wilks, Harvey Crane, Dr. G. M. Kinsey, D. T. Davies, Jr., C. W. Meck and C. H. Cummins.

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